AIR CONDITIONING HEATING AND VENTILATING

MAY 1960

For the Engineer
Engaged in DESIGN
APPLICATION
ESTIMATING
SPECIFICATION
and LAYOUT

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Supermarkets are important factors in food retailing. For valuable design data regarding the air conditioning and heating of these markets, see page 73.

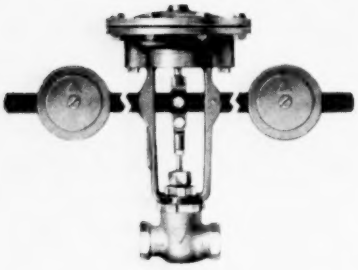
Watts pressure regulators stand up under the toughest conditions you can find in industrial, commercial, or institutional applications. One good reason: Watts engineers, backed by 85 years' experience, know what's expected of a pressure regulator. They design advanced features that mean an extra measure of protection and control. Result: top performance and unusual dollar value.

WATTS PRESSURE REGULATORS

STEAM AND AIR SERVICE

No. 127 Single Seated Pressure Regulator

Large capacity, remote control, diaphragm type. Renewable stainless steel seats, with composition or stainless steel discs for saturated or superheated steam service. Initial pressures to 250 lbs. Reduced pressure range 1-100 lbs. Sizes ½" to 3".



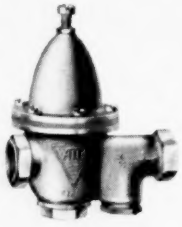
No. 125 Single Seated Pressure Regulator

Same as No. 127 except weight and lever type for finer adjustment in lower ranges. Delicate balance and constant weight load against pressure make it extremely sensitive. Range from 1 to 15 lbs.

No. 152 Self-Contained Single Seated Pressure Regulator

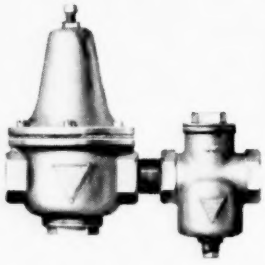
Limited capacity, self-contained, tight-closing regulator for close control of reduced pressure process steam or air. Cast iron body for initial pressure to 150 lbs., bronze body for initial pressure to 250 lbs. Inner valve assembly renewable as a unit. Sizes ½" to 1".

WATER SERVICE



No. 135 Self-Contained Reducing Valve

Bronze body with renewable stainless steel seat and integral strainer screen. Buna-N diaphragm material is high temperature-resisting, corrosion-proof for hot or cold water. Simple to clean without dismantling or removing body from line. Initial pressure to 250 lbs., reduced pressure range 5 to 30 and 30 to 75 lbs. Sizes ½" to 2".



No. 223S High Capacity Self-Contained Reducing Valve

High capacity, durably constructed bronze body reducing valve with separate strainer combination. Renewable stainless steel seat and strainer screen for time-saving maintenance. Initial pressure to 250 lbs. Sizes ½" to 2".

No. 127W Remote Control Diaphragm Spring Type Pressure Reducing Valve

Recommended particularly for service where close pressure regulation is necessary due to extensive changes in water volume demand. Reaches full capacity with negligible drop in reduced pressure. Maintenance is simple and inexpensive — valve disc and nickel alloy seats replaced quickly. Fine bronze body. Initial pressures to 250 lbs., reduced pressure ranges from 10 lbs. to 100 lbs.

Servicing convenience is designed into Watts pressure regulators. Maintenance is simple, so you can restore service quickly with minimum downtime. Watts No. 127 steam and water pressure regulator, illustrated below, is a typical example.

Diaphragm chamber easily changed by removal of two bolts.

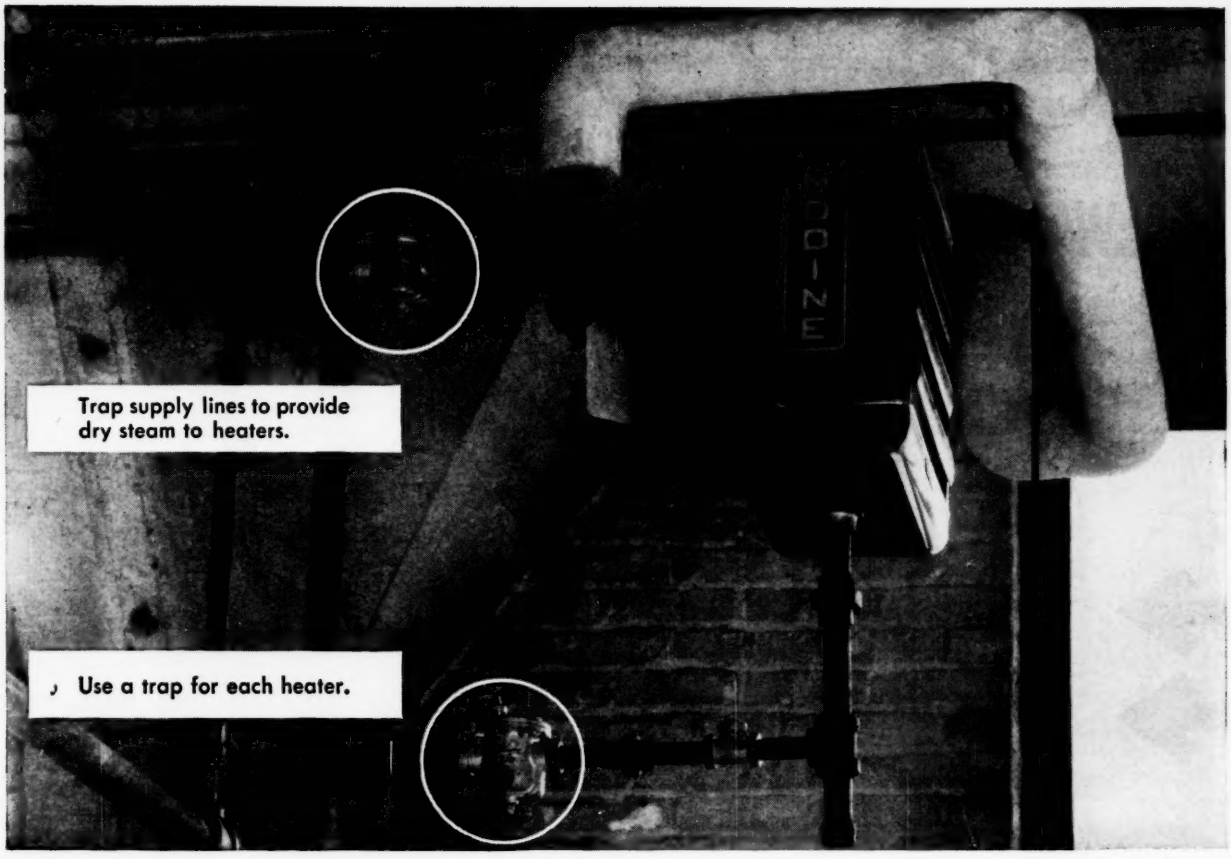
Various pressure conditions can be met quickly by interchanging various sizes of diaphragm chambers and springs.

Lugs on bonnet permit easy removal of topwork by applying hammer and blunt tool. Bonnet design permits removal of topwork as unit, does not alter adjustment.

Valve disc quickly replaced by removing disc retaining nut.

TWO FOLDERS TELL THE STORY

Send for one or both. F-135A has complete data on regulators for water service, including specifications and sizing recommendations. F-127B has the same for regulators for steam and air service. Watts Regulator Co., Lawrence, Massachusetts.



Tips on Trapping Unit Heaters for Full Output and Low Maintenance

• If unit heaters are clean and the steam supply and return lines are adequate, their performance will depend entirely upon the steam trapping. Here are some trapping pointers to insure plenty of heat when it is needed:

1. Trap supply lines to take care of condensate formed by radiation loss.

2. Use one trap for each heater. Two or more heaters drained by a single trap will fail to deliver maximum btu output.

3. Size traps properly. Many a unit heater is handicapped by a trap lacking adequate condensate and *air* handling capacity. The few dollars extra for larger traps insure fast heatup, full output and freedom from coil corrosion.

4. Install traps correctly. Put trap below and close to heater. Install a bypass around the trap if the heater must be kept in operation at all times. A shut-off valve in the discharge line facilitates trap inspection. Use of check valves and strainers is dependent upon piping conditions and the traps used.

5. Protect against PRV failure where freezing could occur. Sometimes heaters supplied with reduced pressure steam are installed where freezing could occur if traps failed to open. In this case select traps that will open at maximum steam supply pressure and still have adequate capacity at reduced pressure.

FREE ON REQUEST—COMPLETE INFORMATION on the above points, diagrams, selection data, tables and additional recommendations are contained in Armstrong Bulletin No. 252. Also includes BTU output ratings for all models of 30 makes of unit heaters. Call your local Armstrong Factory Representative or write direct.

860 Series for low pressure heating service.

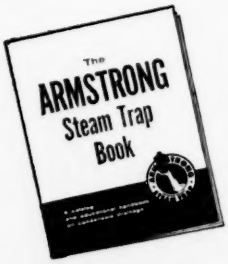
800 Series, side inlet, side outlet.

No. 801, side inlet, bottom outlet.

880 Series, integral strainer.

200 Series, bottom inlet, top outlet.

Forged Steel Series for high pressures, high temperatures.



The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

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8465 Maple Street Three Rivers, Michigan
"See Our Catalog In Sweets Plant Engineering File"

NEW LOW SILHOUETTE FANDAIRE AIR-COOLED CONDENSERS

ALWAYS FACED RIGHT —NO MATTER WHAT THE WIND DIRECTION

No need to position circular Fandaire Air-Cooled Condensers to meet prevailing winds. Just set it anywhere for easiest piping.

Exclusive Aimco fintube design provides high-heat dissipating efficiency for circular Fandaire condensers.

Here's the newest, most advanced air-cooled condenser on the market—Fandaire! This modern low silhouette condenser is engineered around a new high-heat dissipating fintube of exclusive design and manufacture. In operation, the entire spiral of fintubing is surrounded with a circle of swiftly moving cool air for highest cooling efficiency. Every degree in temperature drop is fully utilized as this circular design captures the wind from *any* direction, regardless of placement or location. A powerful fan pulls cool air in and pushes warm used air up and away. Fandaire's constant gravity tube drainage gives continuous movement to condensate.

With its low, clean-lined silhouette, Fandaire does not detract from the general architectural effect of the building. And weighing ⅓ less than conventional installations, the Fandaire usually can be positioned where needed, without guy wires or extra bracing. Savings in piping and installation alone may be considerable.

Where there is a problem of architectural compatibility, or of cost or performance, chances are the new Fandaire Air-Cooled Condenser is the best solution. Engineered in sizes from 3 to 120 tons per unit, there is a Fandaire model for practically all single or multiple installations. Get complete information today.

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AIR CONDITIONING HEATING AND VENTILATING

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COVER PHOTO: Today's supermarkets are a far cry from the stores that were considered adequate and modern for retailing food, say, 25 years ago. W. A. Zumbiel, a design engineer for a large food chain, discusses in this month's Building Type Section, beginning on page 73, **air conditioning and heating practices in relation to the growth of supermarkets** in size and scope over the years, and he recommends a design policy of standardization and simplification for new systems.

HIGH SPOTS in this issue

POWER VENTING: Many special venting problems of incorrectly installed gas-fired heating equipment can be solved by "power venting," which is defined as the **use of mechanical energy to remove combustion products from a building.** A full discussion of this subject by J. Paul Jones, of Baltimore Gas and Electric Co., begins on page 53.

CONTRACTS: Contract letting can have a profound effect on the later installation, coordination and supervision of a job, and when some group takes a strong stand on this controversial subject, it usually makes news. This is what the National Association of Plumbing Contractors has done with its stand for **separate mechanical contracts.** An elaboration of the NAPC position and some engineers' comments on the subject are presented on page 93.

SUB-SURFACE DRAINAGE: A plumbing designer tells on page 64 how he sized a drainage system to protect the basement and boiler pit of a **building subject to variable ground water levels.** He had very scanty data to go on, but his estimates were subsequently proven to be quite realistic by a happenstance that nearly resulted in costly damage to the partly finished structure.

UNUSUAL INSTALLATION: Here is a story about two holes in the ground. One well **pre-conditions ventilating air in summer** before being used to cool the refrigerant compressors. The other well is shallower, hence warmer, and is used to **preheat ventilating air in winter** before its use in the heat pump's evaporator. See this month's Applications and Installations on page 90.

INSULATION STANDARDS: A performance standard for **insulating electrically heated and air conditioned homes** was the prime objective of a study committee representing manufacturers, associations and utilities. Out of these labors was born the All Weather Comfort Standard. The Standard, plus one association's extension of it already, begins on page 57.

SOVIET VISITOR: While we were in the process of editing Dr. I. F. Livtchak's article on **single-pipe hot water heating,** which appears in two parts, starting this month on page 60, the author paid us a surprise visit at our office on Worth Street. Snapshot shows him flanked by interpreter, left, and assistant. Part of a twelve-man group from Moscow that toured the United States, he combined pleasure and business by devoting several days to collecting data on American heating and ventilating practice. In New York he toured public housing units.

And in New York — A FUTURE OF FAULTLESS SERVICE

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New York, N.Y.

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architects

JAROS, BAUM & BOLLES
mechanical engineers

TURNER CONSTRUCTION CO.
general contractor

EUGENE DUKLAUER, INC.
plumbing contractor

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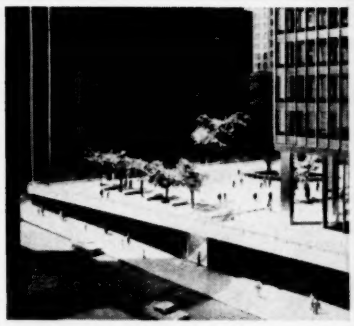
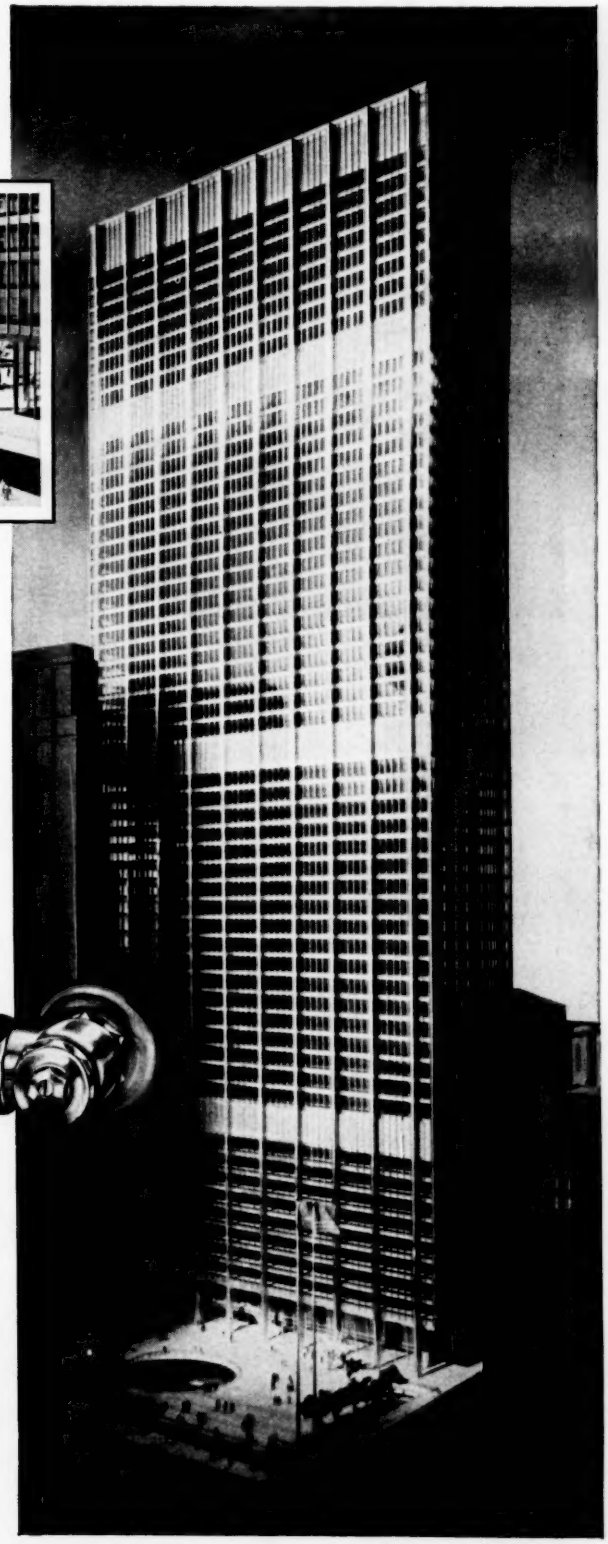
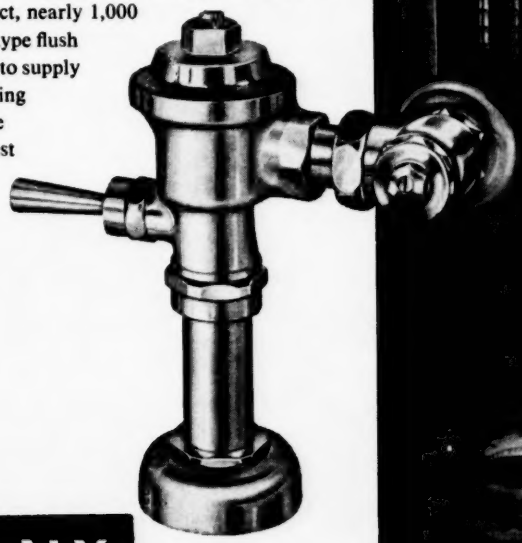




All of New York's crowded financial district awaits the completion of the stunning Chase Manhattan Bank Building ...another COYNE & DELANY installation...which will provide welcome open space, light and air through its 2½ acre plaza covering two city blocks. Rising 60 stories without setback, the rectangular glass and aluminum tower will house 15,000 workers when work ends in mid-1962. The Chase Manhattan Bank Building is in every sense a pacesetter for future lower Manhattan construction and all equipment was painstakingly culled before specification.

In this quality project, nearly 1,000 DELANY diaphragm type flush valves were selected to supply the satisfying and unflagging service that has made DELANY—"the fastest growing name in flush valves!"



DELANY *Flush* VALVES

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Imaginative Engineering Puts to Work on *DAYLIGHT*

Mike Best and Ed Kralovec, mechanical engineers on the Madonna school, shown discussing job details with two of their colleagues.

Kralovec & Best, consulting engineers, went one step further in their heat and ventilation design for the new Madonna High School, Chicago — they applied pneumatic control to skylight louvers.

To meet the lighting requirements of the combination auditorium-gymnasium, architect C. I. Krajewski used a system of sky domes equipped with adjustable light dampers. How to control the dampers quickly and efficiently for change-over from plenty of daylight for gym activities to total blackout for movies, etc., was the problem presented to the consulting engineer.

Kralovec & Best's solution was — twenty-nine 4-inch powerstroke piston damper motors — one for each of

Sky domes, inside and out. Each contains a set of light dampers, all of which operate simultaneously when darkness for movie showings is desired in the combination auditorium-gymnasium.

Powers Pneumatic Control

MADONNA HIGH SCHOOL
Chicago, Ill.
Architect: C. I. Krajewski, Chicago
Consulting Engineers:
Kralovec & Best
Chicago
Heating Contractor:
Windsor Heating Co.
Chicago

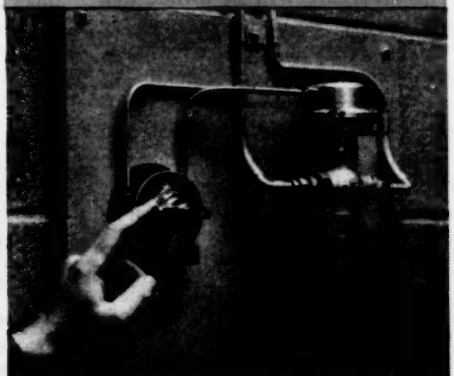
the sky dome louvers on the roof — energized instantly from a single Powers pneumatic selector switch in the projection room. Turning the switch activates air pressure at 15 psi. through a Powers Series 500 Pilot Valve to the motors to close the light louvers. When the switch is turned off, pressure is released . . . and the louvers swing open to admit light.

Pneumatic control of daylight in Madonna school is fast, easy and quiet — a definite convenience for the projectionist or instructors, an operational bargain for the school, maintenance-wise.

The complete heating system, as specified by Kralovec & Best, includes two hot water converters controlled at fixed temperatures. Individual classrooms are heated and ventilated by unit ventilators, controlled on the standard day-night cycle. Corridors, rest rooms, storage and locker rooms employ direct radiation controlled by Powers Day-Night room thermostats. For extra safety and comfort, hot water to all showers is controlled by means of a Powers Hydroguard Thermostatic Shower Control.

Here, then, is how imaginative engineering applied to pneumatic control can have unusual — but practical — results in an efficient, low cost system.

A single pneumatic selector switch in the projection room activates 29 sets of light louvers through 29 individual powerstroke motors.



Write for the latest Powers Catalog of pneumatic controls for schools.

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NEWS OF THE MONTH

Twenty-Story United Engineering Center To be Stainless Steel and Glass

Stainless steel and glass will sheath the $12-million, 20-story curtain wall building rising opposite the United Nations Building, between 47th and 48th Streets, in New York City. To be occupied by 18 leading American engineering organizations, with a combined membership of 300,000, the United Engineering Center will provide 180,000 sq ft of floor space.

To House Engineering Index

In addition to executive offices for engineering societies and joint organizations, the Center will house the world's most complete engineering library, and the Engineering Index, a comprehensive indexing and abstracting service for engineering profession.

Designed as a basic glass and stainless steel grid system with fixed windows, glass spandrels, and a masonry service core, the United Engineering Center will use 20 to 14 gage stainless steel, Type 302, for the window frames, mullions and column covers. The lobby and entrances will be masonry, glass, and stainless, inside and out.

The structure will be owned and operated by United Engineering Trustees, composed of representatives of the American Society of Civil Engineers; American Institute of Mining, Metallurgical and Petroleum Engineers; The American Society of Mechanical Engineers; American Institute of Electrical Engineers; and the American Institute of Chemical Engineers, all of which will be housed in the new structure.

Other occupants will be the American Institute of Consulting Engineers; American Institute of Industrial Engineers; Society of Women Engineers; American Welding Society; American Society of Heating, Refrigerating and Air-Conditioning Engineers; Illuminating Engineering Society; Engineer's Council for Professional Development; Engineers Joint Council; Welding Research Council; Engineering Societies Library; Engineering Index and the Engineering Foundation.

New United Engineering Center rising opposite the United Nations Building in New York. Trustees appealing for fund.

Many of these engineering groups are now housed at the Engineering Societies Building, 29 West 39th Street, built more than 50 years ago. With the growth of the engineering profession and resultant demands for additional space, the present headquarters building has long been outmoded.

Fund Appeal

Architects for the new building are Shreve, Lamb & Harmon Associates; Turner Construction Co. is the general contractor. Construction is scheduled to be completed in mid-1961. Contributions are being requested by the United Engineering Trustees, Inc., 29 West 39th St., New York 18, N. Y., who report that gifts are deductible for income tax purposes.

ELECTRIC HEATING SHOW BUZZES OVER BILLION DOLLAR PROSPECT

With 850,000 homes already electrically heated and a goal of 6 million set for the close of this decade, the electric heating market, in terms of equipment and labor, will soon reach one billion dollars annually, according to the Electric House Heating Equipment Section of National Electrical Manufacturers Association (NEMA), New York, N.Y., whose recent Symposium and Exposition in Chicago was a rousing success.

Enthusiasm ran high at the Symposium's several general sessions and seminars. Typical was the comment of Pennsylvania Electric Company's residential and rural sales manager, R. W. Smith, who explained that "when electric heating connects, we really clean the bases. The home goes all-electric. We 'shut out' competition."

"Interest among the utilities in electric heating has increased rapidly in the last few years," Robert M. Wood of Ebasco Services, Inc., stated. "Where this change in attitude has taken place, it has been based upon the realization that electric heating has become an extremely attractive and profitable load. . . ."

Over 3,000 Jam Hotel

Over 3,000 representatives of various branches of the electrical industry jammed the Sherman Hotel in Chicago for the three-day March meeting. Only 700 were expected. The program and exhibit were open to the trade only.

Many manufacturers' representatives discussed the question of equipment standards. R. D. Graham of General Electric Company's Electric Resistance Comfort Heating Section explained that NEMA started a year and a half ago to develop standards for equipment offered by its member manufacturers. Recently NEMA announced the issuance of Standards Publication

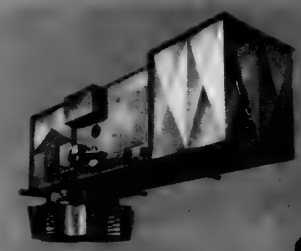
(Continued on page 10)

A complete line for every need

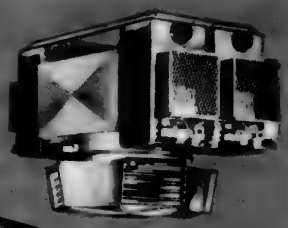
WING

GAS FIRED

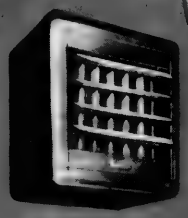
HEATING and FRESH AIR SUPPLY EQUIPMENT



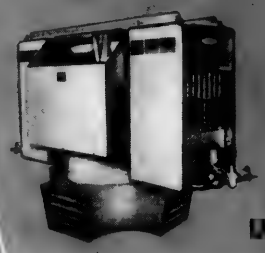
Fresh Air Supply Heaters



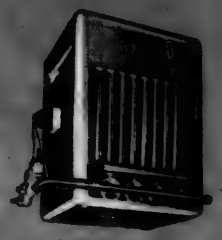
Duct Heater Assemblies



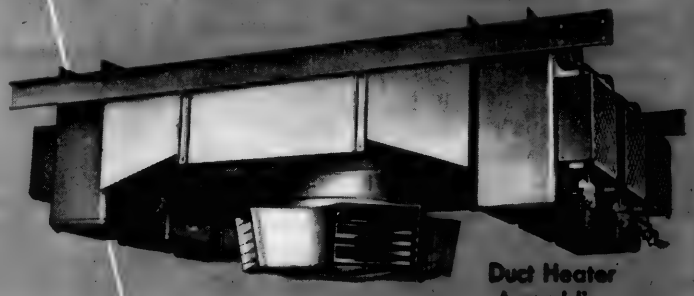
Unit Heaters



Revolving Unit Heaters



Duct Heaters



Duct Heater Assemblies

No matter what your gas heating problem, there is a Wing heater designed to do the job.

Gas-fired Unit Heaters for small areas — stores, offices, motels — or for supplementary heating of large areas.

Gas-fired Duct Heaters for use where the heat must be moved through ductwork to other areas for proper utilization.

Gas-fired Duct Heater Assemblies for large areas. These units, which are available with two, four or six heaters, coupled with the proper choice of one of the many Wing fixed or revolving discharges, can cover areas ranging up to 132' square.

Gas-fired Fresh Air Supply Heaters — for supplying fresh, heated make-up air to increase the efficiency of exhaust systems, provide positive pressures that prevent drafts and cold air leaks into the building. Increase workers' comfort. Available for roof or wall mounting.

These gas units, as with all Wing heating equipment — gas, steam, hot water or electric — are manufactured to provide low installed and operating costs.

For complete catalog data on all these Wing products write today or contact your local Wing representative

WC132

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FACTORIES: LINDEN, N. J. AND MONTREAL, CANADA

WING

ELECTRIC HEATING

(Continued from page 8)

HE 2-1959 on electric house heating equipment. The number and type of thermostats in a home heating system was also the subject of many comments.

Heat Pump Seminar

At the seminar on heat pumps, Fred J. Reed, chief engineer of Air Conditioning and Refrigeration Institute (ARI), called for a go-slow attitude on standards for this type of electric heating equipment.

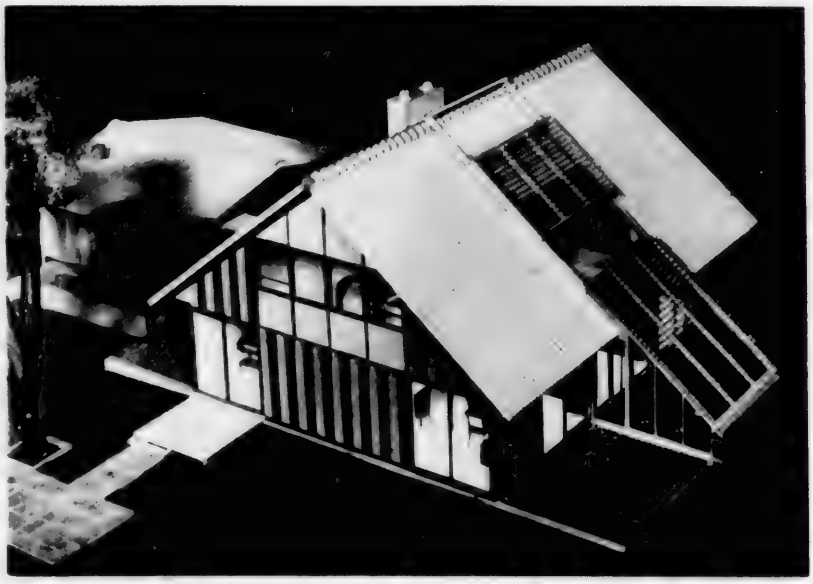
"The heat pump," Mr. Reed stated, "has only relatively recently attained acceptance as a product unit for widespread application. The possibilities of cycle arrangement, component design, controls and other features are only just unfolding.

"To write, and require adherence to, a standard specifying what constitutes such equipment would be an unwarranted restriction on the resourcefulness and ingenuity of the engineers and others involved in the development of this equipment. Consequently, for the present, equipment standard for heat pumps should—and, I predict, will be confined to definitions, terminology, and safety requirements."

Auxiliary Heating Is Important

At the seminar for contractors, David Somes of Somes Electric Company told of his company having installed over 650 kw of electric heat in northern Michigan. "We have houses now that are being heated for as little as 22 cents per square foot, although our average is 27 cents," he stated. "Also, we have found that there are many uses for auxiliary heating equipment and that this market accounts for a great deal of our business."

Statistics on auxiliary heating on a national scale were available from C. F. Kreiser, chairman of NEMA's Electric House Heating Equipment section. He stated that home owners have invested a total of $23,000,000 so far in electric heating units for spare rooms, bathrooms, and other similar locations. He forecast cumulative expenditures for such equipment of $191,000,000 by 1970.



RESEARCH HOUSE. Scale model of the Ferro Porcelain Enamel Research House now being erected in a suburban community near Cleveland, Ohio, by more than twenty major companies. The project is designed to test many revolutionary ideas in residential construction and is scheduled for completion in May. It will be used to explore methods of adapting residential housing components to the techniques of mass production, as well as serving as a proving grounds for advances in plumbing, heating, and wiring systems. The roof, all exterior walls, and all interior walls in the kitchen, bathroom and utility areas will be finished in porcelain enamel, in a variety of colors and textures.

Air conditioning is responsible, at least to a substantial extent, for electric heating, C. W. Cheatham, supervisor of heating and air conditioning for Alabama Power Company said. Electric heat provides the same degree of living comfort in winter that electric cooling does in summer, he pointed out.

Air Conditioning Spurs Electric Heat

"It is roughly estimated that for each five window-type, and each central-type air cooling unit in use on its system," Mr. Cheatham continued, "an electric utility with a summer system peak can add one complete electric house heating installation to provide a winter counter-balancing load. With the lead in installed cooling units already attained, it will require substantial additions of electric space heating to anywhere near accomplish this balancing effect."

J. C. Leach, manager of special services for Commonwealth Edison Company, emphasized the attractiveness of electric heating to school boards near the limit of their bonding power. "Our experience has shown that electric heat, with the proper insulation, generally costs less to install than the heating plant, piping, etc., that go with a conventional system," he said. "Every investment dollar saved can be put into more classroom facilities. (The school boards) can stand a little higher operating cost if this saving can be made. In the case of additions to existing buildings, no heating plant revision is necessary."

AIR FORCE REQUIRES ARI SEAL ON UNITARY AIR CONDITIONING

The Air Force has announced a newly established requirement for Air Conditioning and Refrigeration Institute Certification for all unitary air conditioning equipment.

Provisions for the new certification requirement are spelled out in Air Force Pamphlet No. 91-2-1, dated January 29, 1960. Unitary air conditioning equipment consists of

(Continued on page 12)

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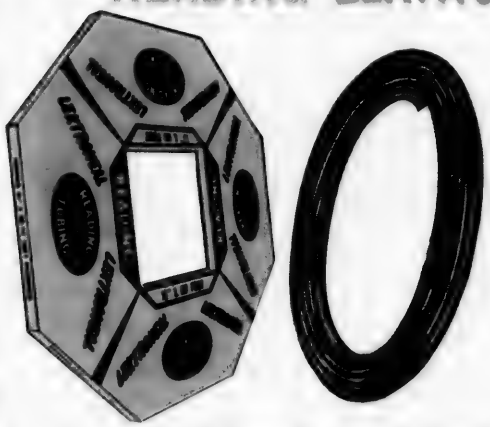

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AIR FORCE REQUIRES ARI SEAL

(Continued from page 10)

one or more factory made assemblies which normally include an evaporator or cooling coil and a compressor and condenser combination, the pamphlet explains. Where such equipment is provided in more than one assembly, the separated assemblies are designed to be used together and the ARI certification is based upon the use of matched assemblies. The certification program does not apply to heat pumps or room air conditioners.

The Air Force pamphlet recommends that in future Air Force specifications for this type of unitary air conditioning equipment, a sentence be included similar to the following: *The Air conditioning equipment to be supplied or installed under these specifications shall be certified under the Air Conditioning and Refrigeration Institute Certification Program. The manufacturers of the equipment shall furnish to the Contracting Officer a copy of the Air Conditioning and Refrigeration Institute listing or ARI Certification of the equipment.*

LIGHTWEIGHT AIR CONDITIONER TESTED BY ARMY ENGINEERS

A lightweight, compact air conditioner for use in missile control vans is being tested by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

The new 50,000 Btu per hr unit weighs 350 lb, compared to approximately 1,200 lb for an air conditioner of conventional design. Only one-half the size of a conventional unit, it is capable of cooling a house with 2,000 ft of living area.

Designed primarily for use in control vans of the Hawk and Sergeant missiles, the light model has been reduced in weight through the utilization of aircraft type components. One is a 10.5-lb compressor called Heli-Rotor.

Refrigerant 12 is used because it is obtainable in all parts of the world and is stocked by the Army supply system. It is the primary refrigerant used in all Army field type air conditioning and refrigeration equipment.

The new air conditioner was designed and built by Stratos Division, Fairchild Aircraft and Engine Corporation, under contract with the Corps of Engineers.

Proposed Polyethylene Pipe Standard Forwarded to Department of Commerce

A proposed Commercial Standard on flexible polyethylene pipe, incorporating minimum wall thickness requirements, was unanimously approved by the Thermoplastic Pipe Division of the Society of the Plastics Industry, Inc., at its quarter year conference held in the Fairmont Hotel, San Francisco. The Division includes 52 pipe and fittings manufacturers.

In making the announcement of this action taken by the group, George C. Anderson, division chairman and manager for product development, National Tube Div., U. S. Steel Corp., explained that the document covers three types of polyethylene pipe — depending on the derivative of the base resin in the pipe compound. These include Type I (0.910 to 0.925 specific gravity); Type II (0.926 to 0.940 specific gravity); and Type III (0.941 to 0.965 specific gravity), for low density, medium density, and high density material respectively.

The proposed Standard covers one schedule and two series of polyethylene pipe including dimensions for Schedule 40, Series 2 and 3.

The proposed Standard also contains a number of performance requirements including a sustained pressure test and an environmental crocking test. It has now been forwarded to the commodity standards Division of the U. S. Department of Commerce where it will shortly be established as a revision to the existing polyethylene pipe Standard CS 197-59.

Testing Facilities Expanded

The facilities at the National Sanitation Foundation Testing Laboratory at the University of Michigan, Ann Arbor, Mich., have been increased to handle the physical as well as the toxicological testing of all types of thermoplastic pipe to ascertain if these products conform to all requirements of the existing commercial standards as well as the rigid conditions of the National Sanitation Foundation in regard to suitability of plastic pipe for the transportation of potable water.

The group will continue to be concerned with extensive code work in an endeavor to have plastic pipe incorporated in additional state and municipal plumbing codes through the country. This activity is carried

(Continued on page 14)

At New Headquarters

Harry C. Ballman, director of Air Pollution Control Division, National Coal Association, set up headquarters in NCA's new Coal Building, at 1130 17th St., N.W., Washington, D.C. He announced establishment of field offices in Cincinnati, Ohio, under A. L. Kiewit and in Colonia, N.J., under George W. Biven. Both are professional power engineers.

Mr. Ballman, former executive secretary of the Air Pollution Control Association, will direct the expanded program of the coal industry in air pollution control activity. The new program will attempt to fill requests for assistance on air pollution control problems from private industry, government agencies, civic groups, and technical and trade organizations, as well as coal industry management.

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PLASTIC PIPE STANDARD

(Continued from page 12)

on by the Plastic Pipe Research Council, whose chairman is George C. Reed, American Hard Rubber Company.

Plumbing Codes Amended

States which have now amended their plumbing codes to specifically include plastic pipe for varied water services are California, Wisconsin, Illinois, Arkansas, Kentucky and Maine.

The SPI Thermoplastic Pipe Division is immediately undertaking the preparation of a comprehensive engineering manual on all types of plastic pipe including installation techniques and applications.

During the course of the meeting the members discussed the status of FHA approval of Polyethylene Pipe. It is expected that FHA will shortly approve the use of this type of pipe for water service lines, jet pump installations, well-to-house piping and lawn sprinkler systems.

PVC Standard Now Official

It was also announced at the San Francisco meeting that a new polyvinyl chloride pipe standard containing both material and performance requirements has now been officially established by the U. S. Department of Commerce. This standard is CS 207-60. A plastic drain and sewer pipe standard has also been recently promulgated by the U. S. Department of Commerce. This standard, known as CS 228-60, includes dimension and tolerances as well as test requirements and quality control tests for plastic drain and sewer pipe manufactured from styrene rubber materials. At the present, three standards on ABS (Acrylonitrile-butadiene-styrene) plastic pipe developed by the industry and approved by consumers have now been officially processed by the U. S. Department of Commerce. These are: CS 218-59, rigid ABS Plastic Pipe (IPS Dimensions); CS 219-59, dimensions and tolerances for solvent welded rigid ABS plastic pipe; CS 220-59, dimensions and tolerances for lightweight rigid ABS plastic pipe.

Building Maintenance and Repair Clinics Emphasizes Professional Aspects of Subject

James N. Morris, founder and principal of James Neil Morris & Associates, has been conducting a series of building maintenance and repair clinics in major cities throughout the nation.

Maintenance Costs Rising

Decision to hold these conferences followed a series of conferences with representatives of numerous national associations and professional groups concerned with the mounting cost of maintenance in schools, hospitals and institutional facilities. Mr. Morris has arranged for nationally recognized authorities to discuss the following specific topics on the program of each clinic: (1) professional engineering evaluation of building maintenance; (2) planning maintenance programs by meaningful work categories; (3) planning and building for maintenance; (4) how to save money in building maintenance; and (5) contract vs. do-it-yourself maintenance.

For the past 4 years prior to his recent return to independent practice as a consultant in building management, Mr. Morris had served as chief engineer of repairs and director of General Services Administration's Repair & Improvement Division. In this capacity, he had directed this agency's annual programs of about $75 million in the repair and improvement of more than 5,000 government-owned and leased buildings throughout the nation, including the development, programming and coordination of a long-range $328 million nationwide air conditioning program.

Next Clinic June 1

Objective of the clinic is to emphasize the professional aspects of building maintenance to management and to apply proved concepts of engineering and sound construction practices to the broad field of buildings management. The next clinic will be at the Biltmore Hotel in Atlanta on June 1, followed by another at the McAllister Hotel in Miami on the June 10 following.

One of the highlights of the Atlanta program will be a two-hour discussion on "Environment for Learning" sponsored by Carrier Corporation and developed as a research study by Golemon & Rolfe, architects and engineers, of Houston. With the majority of schools throughout the nation having to face up to 185-day school terms and six weeks of summer sessions, this study of the economics of air conditioning is very timely, Mr. Morris says.

The major part of the Miami program will be devoted to waterproofing and control of fungus and mildew in building structures. Registration for the clinics start at 8:30 in the morning and the admission fee is $25 for each participant. Additional information may be obtained by addressing James Neil Morris & Associates, 3304 Pendleton Drive, Silver Spring, Md.

67TH ANNUAL ASHRAE MEETING TO BE IN VANCOUVER IN JUNE

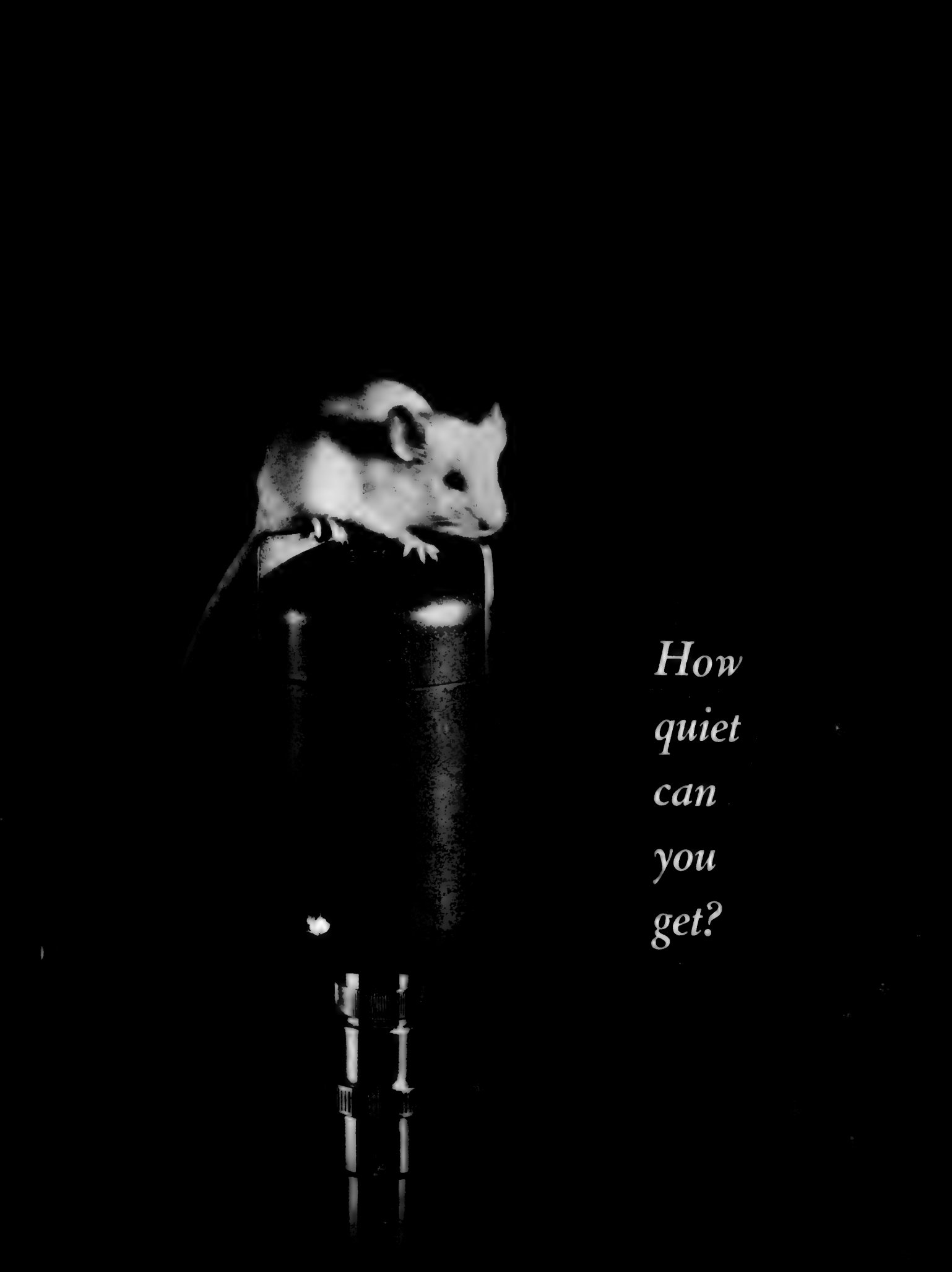
The 67th Annual Meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. will be held in Vancouver, B.C., June 13-15.

The three-day program will include four technical sessions on topics allied with absorption air conditioning, refrigerants, thermoelectric effects and heating.

There will be three symposiums covering domestic refrigerator engineering, commercial refrigeration and air conditioning.

The forums will, as usual, relate to immediate industry problems.

Headquarters for the meeting will be at the Vancouver Hotel. The usual officer and committee meetings will precede and parallel other events. The latter will include the Welcome Luncheon on June 13, when incoming officers are installed, the annual banquet on June 14, various trips to near-by points of interest, and a special program for the ladies.



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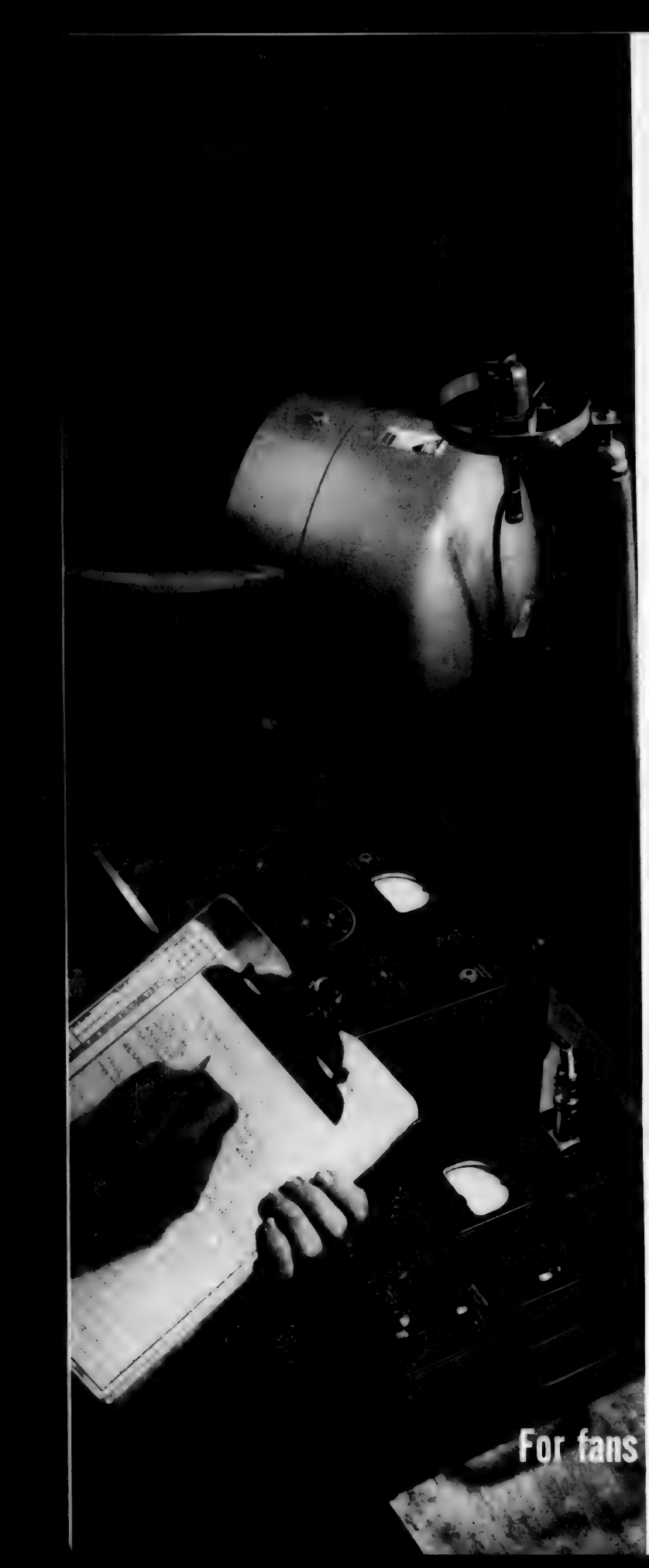

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For fans built to satisfy your "specs"...

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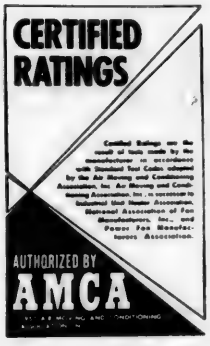

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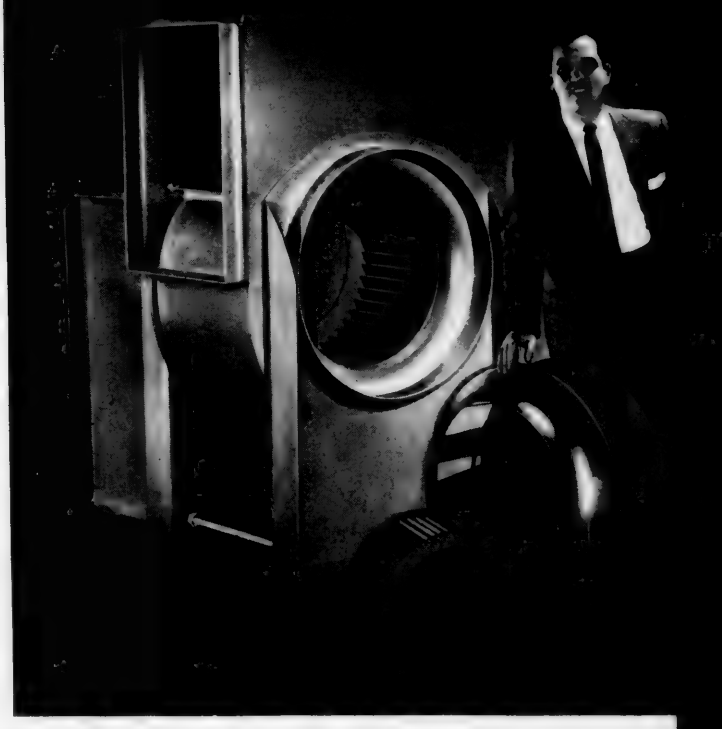

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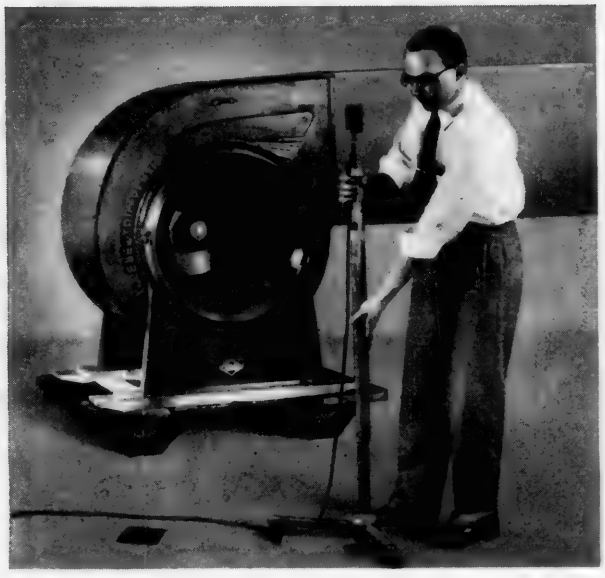

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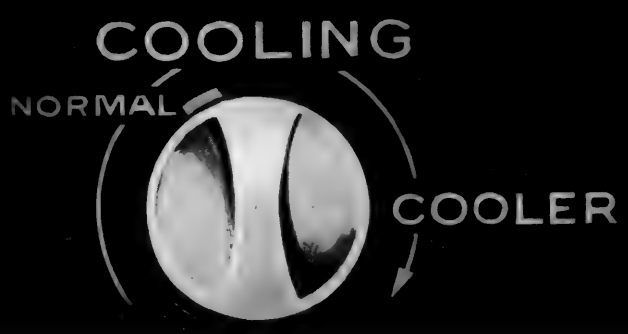

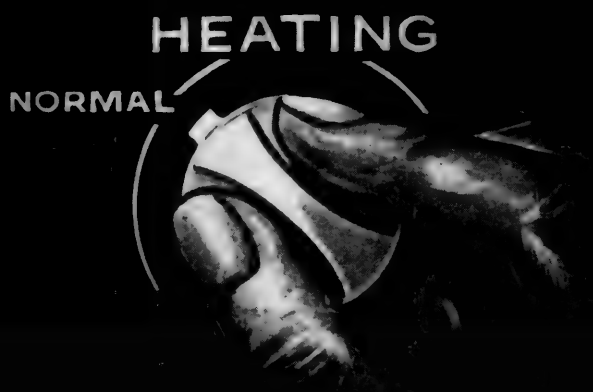

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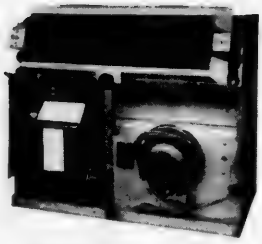
A Webster Newport is *not* a conventional room air-conditioner: it is an individual *system* for heating and cooling that offers a degree of performance efficiency, convenience *and economy* never before possible for new or modernized building installation.

Other year-round air-conditioners require elaborate—and costly—central systems for the cooling cycle. Not so with the Webster Newport. In addition, these attractive in-wall units can be installed a room at a time—without disrupting service throughout the building. Air-conditioning of the entire structure can be completed in stages as budget limitations permit—and at savings up to 30% over central system installations.

Webster Newports connect readily to existing heating systems—or the new all-electric model will tie-in with electrical circuiting. Let a Warren Webster man acquaint you with specific advantages for your building's requirements.



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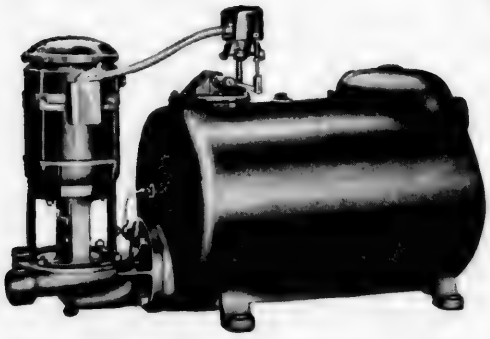

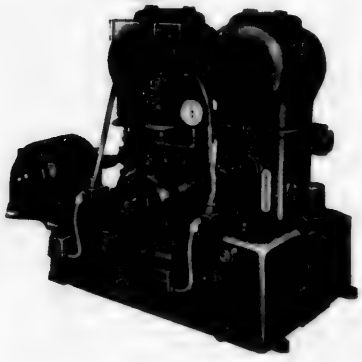

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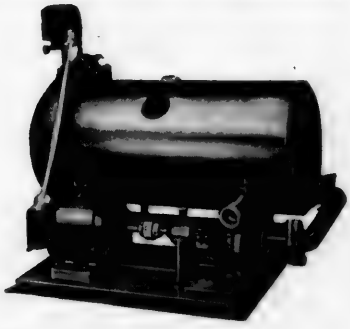

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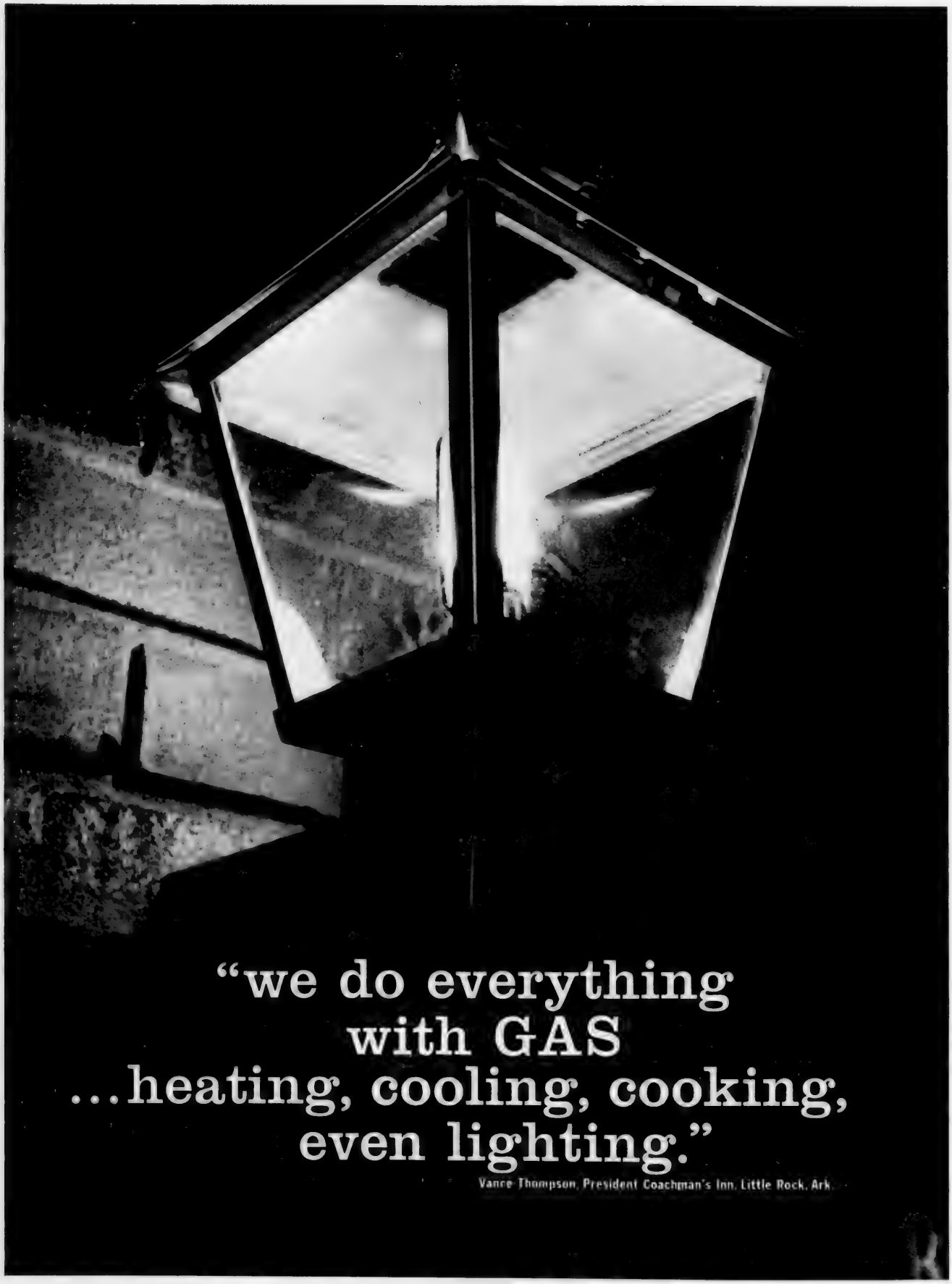
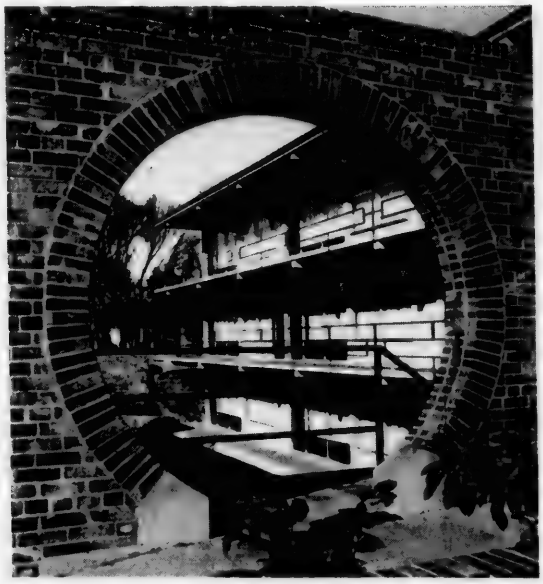
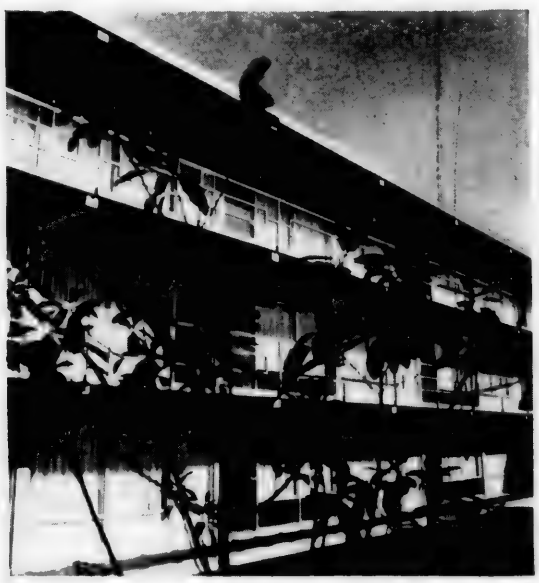

"we do everything
with GAS
...heating, cooling, cooking,
even lighting."
Vance Thompson, President Coachman's Inn, Little Rock, Ark.



The new Coachman's Inn . . . a 258-unit motel in downtown Little Rock . . . is the last word in ultramodern convenience and comfort. In the words of satisfied guests, it has everything.

And everything there that depends on fuel depends on GAS, the most flexible modern fuel. Even the electricity used at the Inn is produced by a gas-driven generator!

Six 25-ton Arkla-Servel Gas absorption units provide summer air conditioning. The source of energy for the chiller units is low pressure steam from a gas-fired boiler. The same boiler furnishes heat in winter.



Guests and management alike appreciate the automatic convenience of the Arkla-Servel gas absorption cooling system. The chillers shut themselves down, one by one, as the load decreases. And, since cooling requirements seldom exceed 80% of capacity, one unit can be shut down if necessary without affecting cooling efficiency.

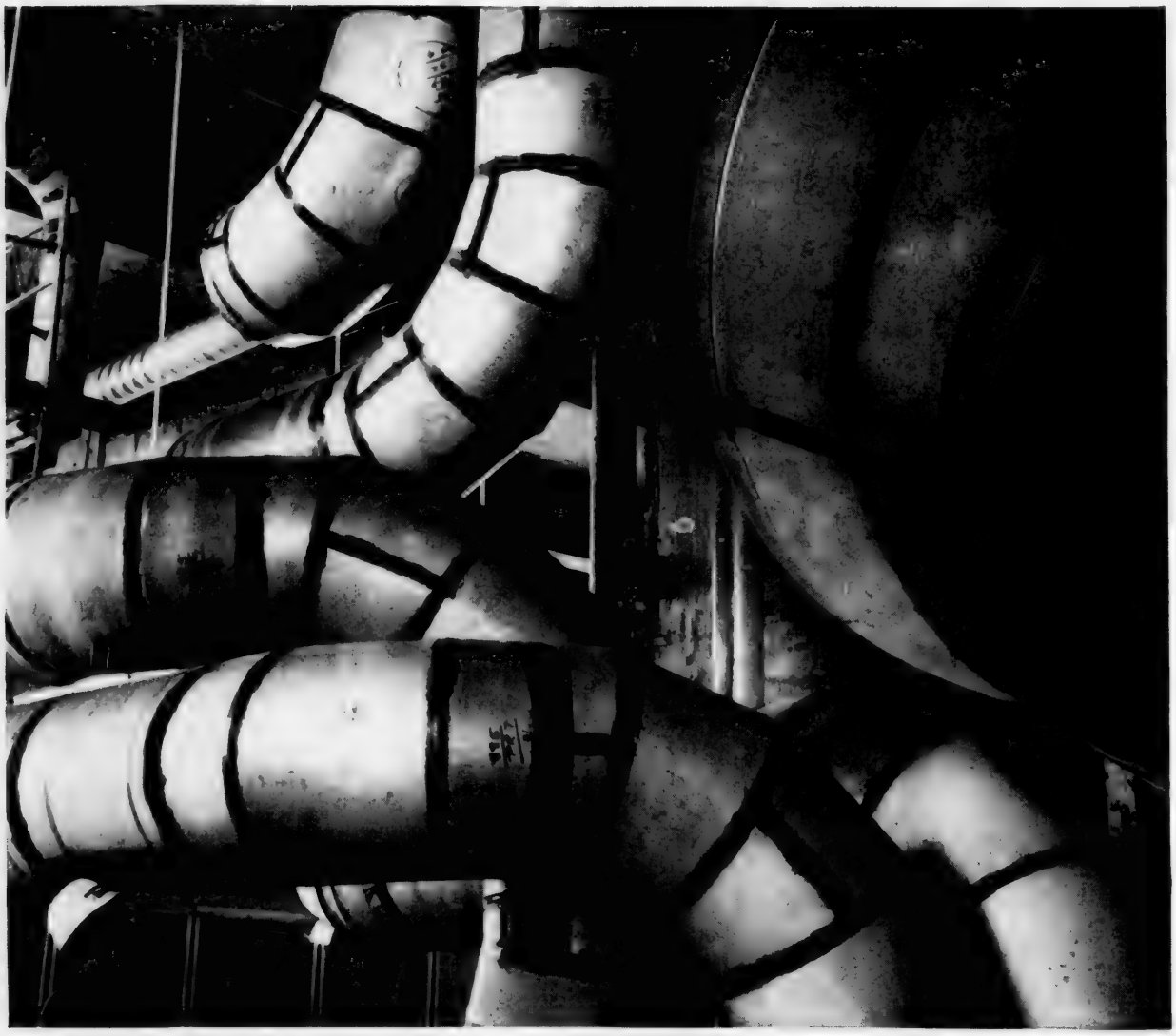
At the Coachman's Inn, year 'round air conditioning is only part of the job for gas. Gas cooks the meals. Heats all water, including the pool. Illuminates the decorative Arkla Gaslites. And, in gas flambeaux, adds a dramatic touch to the beautiful Sunken Patio.

Before you layout your next job, check the all-round efficiency and economy of gas. Remember, gas absorption cooling can put your customers' heating plants on a year 'round paying basis.

For specific details on Arkla-Servel systems, call your local gas company, or write to the Arkla Air Conditioning Corporation, General Sales Office, 812 Main Street, Little Rock, Arkansas.

AMERICAN GAS ASSOCIATION

FOR HEATING, COOLING, COOKING
...GAS IS GOOD BUSINESS



Bethcon Galvanized Sheets used in 9,000-ton air conditioning system

The Chase Manhattan Bank's new main office building towers 810 ft into the lower Manhattan skies. Its 60 stories of office space were designed to house 15,000 workers in year-round, air-conditioned comfort.

The 9,000-ton system, believed to be the largest ever installed in a commercial office building, employs various shapes and sections of ductwork, including square and spiral, as well as specially fabricated risers like those shown above. Bethcon continuously galvanized steel sheets were used in all types of ducts.

Bethcon sheet steel is just right for this kind of sheet-metal work. Strong and rigid, it permits long spans with minimum support. Bethcon is neither too hard nor too soft, making shopwork easy and the end-product sturdy. Bethcon's zinc coating is second to none for its refusal to flake or peel off.

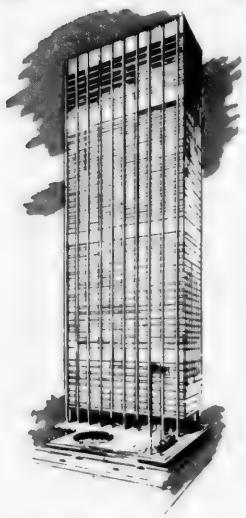
Bethcon is available in a wide variety of gages, with either plain open hearth or copper-bearing (Beth-Cu-Loy) steel. Just get in touch with the nearest Bethlehem representative for whatever details you need.

Steel — For strength ...economy ...eye-appeal

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

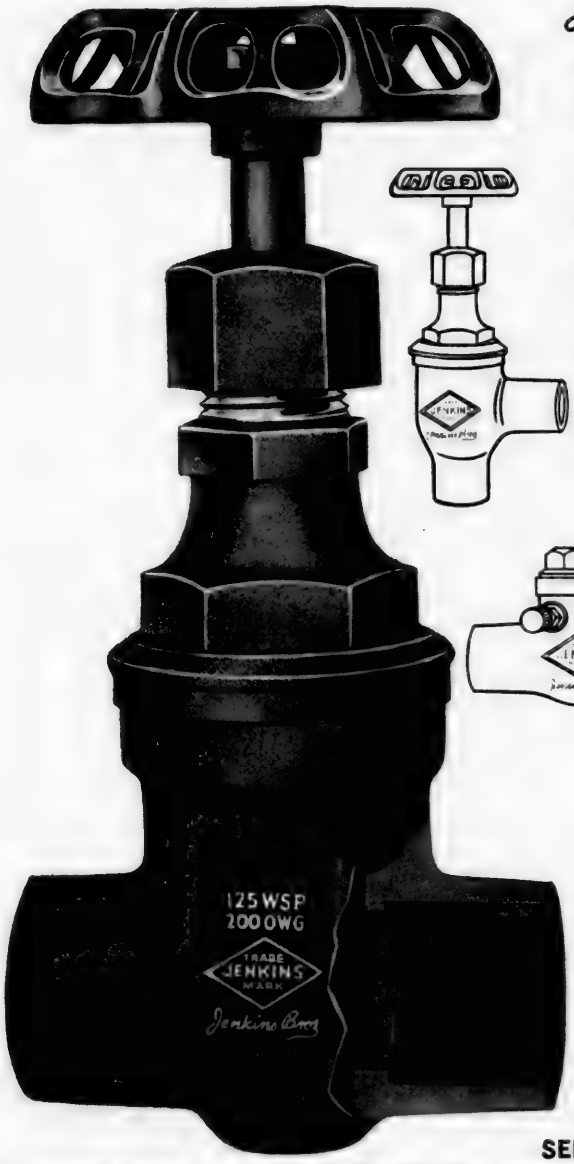


The Chase Manhattan Bank Building, New York City. *Architect:* Skidmore, Owings and Merrill; *consulting mechanical engineers:* Jaros, Baum and Bolles; *general contractor:* Turner Construction Company; *mechanical contractors:* Raisler Corp. and Kerby Saunders, Inc., a joint venture; ductwork fabricated by National Sheet Metal Works, Universal Sheet Metal Corporation, and Carrier Corporation.

A Reliable Way to Judge a COPPER TUBE Piping System

. . . Look for this Mark JENKINS® of Quality Control

Jenkins Bros



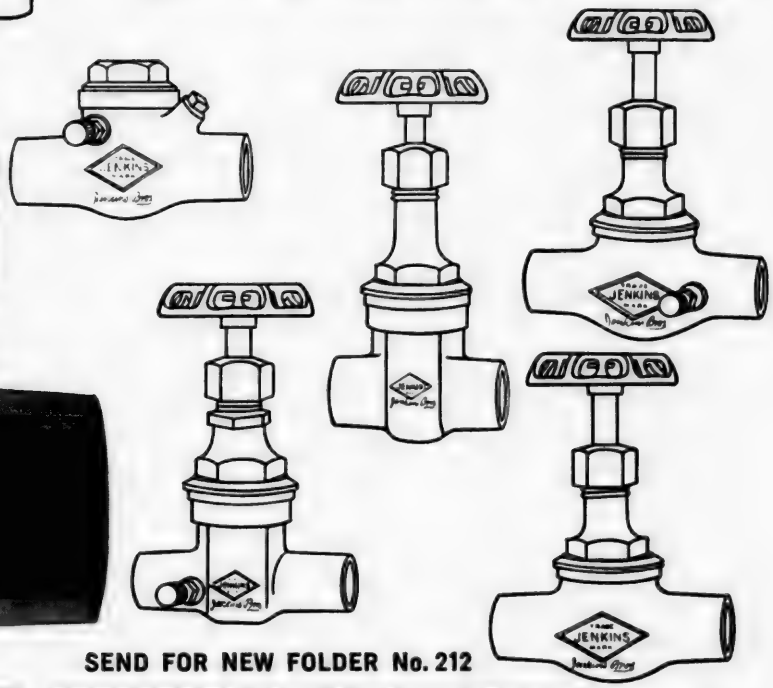
Surest kind of assurance that it is a QUALITY installation is given by the famous Jenkins "Diamond" on valves controlling the lines.

Where "anything will do", you're not likely to see Jenkins Solder (or Socket) End Valves. But you can expect to find them on jobs handled by engineers and contractors who know an economy installation is one you can forget.

Compare Jenkins Solder End Valves with any others. You'll see why they are trusted to give a lifetime of reliable service with a minimum of attention.

Note the thick, smooth bore solder-joint ends that withstand heating and contribute to a quick, leak-proof connection. Look inside at the many Jenkins superiorities in design and construction.

A complete line of top-quality Jenkins Solder End (and Socket End) Valves is available from your local Jenkins Distributor. Ask him to show you a sample of the type you require.



SEND FOR NEW FOLDER No. 2212

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES JENKINS SINCE 1864
Jenkins Bros

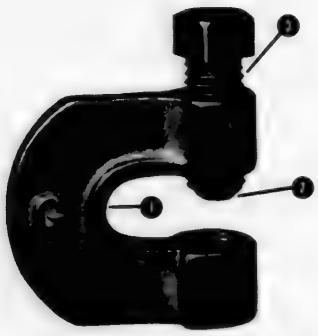
Jenkins Bros., 100 Park Avenue, New York 17
Send folder No. 212 describing all Solder End and Socket End Valves.

Name & Title .....

Company .....

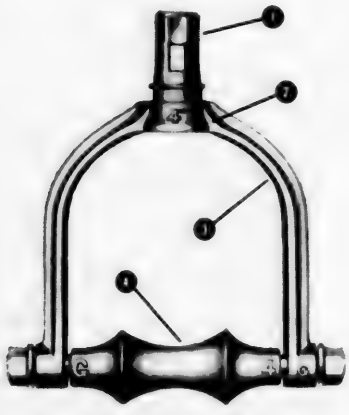
Address .....

Look at all the extras you get in Grinnell Pipe Hangers . . . yet you pay no more!



GRINNELL C-CLAMP, FIG. 88 — 1 Ribbed, malleable iron casting, for extra strength **2** Hardened steel, cup-point set screw for good "grip" on beam **3** Full thread engagement – casting is drilled and tapped for rod and set screw

GRINNELL EXTENSION SPLIT RING, FIG. 138 — 1 Nipple engaging thick section of malleable iron gives rigidity for support from above, below or from wall **2** Tapped to take screw. No nut to lose **3** Special ring contour holds pipe or tubing firmly



GRINNELL ADJUSTABLE SWIVEL PIPE ROLL, FIG. 174 — 1 Swivel shank permits adjustment without elaborate support **2** Locking device prevents accidental adjustment change; no lock nut required **3** Ribbed design in malleable iron for better strength, lightness, appearance **4** Easy installation; maximum adjustment

GRINNELL CB CONCRETE INSERT, FIG. 282 — 1 One body size accommodates several sizes of rods **2** Slot takes reinforcing rods to assure maximum load rating **3** One-piece body prevents concrete seepage **4** Teeth on insert and nut hold rod firmly in place **5** Homogeneous composition of malleable iron throughout

You get *more* hanger for the money from Grinnell, because Grinnell's huge volume reduces production costs . . . lowers prices right into line with competitive hangers offering less.

Yet you get *so much more* . . . wider choice of types and sizes; better quality control; published ratings for *all* hangers; faster delivery from warehouses nationwide; and more responsible field service by trained Grinnell personnel . . . regardless of how far from the job site the sale was made! Grinnell Company, 277 West Exchange St., Providence 1, R. I. Branch Warehouses in Principal Cities.

Remember, The Best Costs No More — from America's #1 Supplier of Pipe Hangers and Supports

Call your local Grinnell Distributor for pipe hangers, cast and malleable iron fittings, malleable unions, steel nipples – all made by **GRINNELL**

DUAL-DUCT
through the
FOUR

Let North winds blow, Summer sun glow —Buensod Dual-Duct affords complete conditioning through all the seasons of the year, heating and cooling, always maintaining proper conditions in every space. And this Buensod-pioneered "all-air" system, with patented automatic volume-controlled mixing units, provides constant air volume in every zone, regardless of variance in static pressures. That means the installation cannot be thrown out of balance, ever. Learn why Dual-Duct is the logical choice for new and renovated structures alike. Write for Bulletin DD-6 or contact your local Buensod representative and get complete details.

BUENSOD DUAL-DUCT

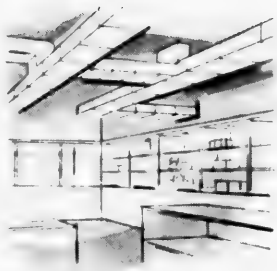
BUENSOD STACEY

Buensod-Stacey Corp. 45 West 18 Street, New York 11, N. Y.

Subsidiary of Aeronca Manufacturing Corporation

One-story construction?

Floor space valuable?



Don't want long runs of ductwork?

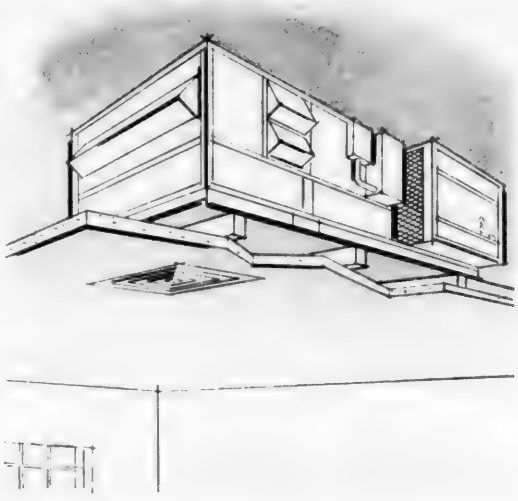
9 times out of 10 this is the most economical way to heat and cool a one-story building!

With the new Carrier Commercial Weathermaker*, year-round air conditioning can be designed and installed more economically than ever in one-story commercial or industrial buildings. It isn't necessary to give up an inch of valuable floor space, because this Weathermaker unit installs on the roof. And it isn't necessary to install expensive and unsightly ductwork, because the unit connects directly to a ceiling air grille. Notice the application here.

This unit is also designed to install with a minimum of time and trouble. It needs no water, no refrigeration piping, no charging with a refrigerant. One or more units can be installed as required, and with the following capacities: 7.5 tons of cooling and 200,000 Btus of heat . . . or 10 tons and 250,000 Btus. What's more, the motor-compressor is protected by a 5-year warranty.

For complete details about this Carrier Commercial Weathermaker, call the Carrier dealer near you. He's listed in the Yellow Pages. Or write Carrier Corporation, Syracuse 1, New York.

*Reg. U. S. Pat. Off.



This Carrier 48B Commercial Weathermaker puts both the heating and cooling plant in the most economical of locations—the roof! It is supplied ready for fast one-unit installation. It is factory charged with refrigerant, equipped with refrigeration piping and quickly connected through the roof to a ceiling air grille.

BETTER AIR CONDITIONING FOR EVERYBODY EVERYWHERE

Carrier

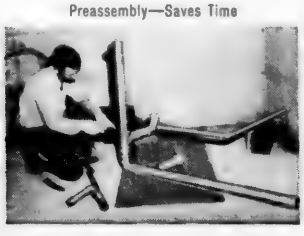
EASIER REMODELING WITH COPPER TUBE. *Overhead work is easier* — no threading, no caulking and a copper tube installation weighs only one fourth as much as one of ferrous piping. *Saves space* — copper tube is trim, solder-joint fittings are compact. *Work is faster* — Anaconda copper tube and fittings for soil, waste and vent lines cut installation time one third to one half. *A better job* — copper tube won't rust: its smooth inside surface resists clogging. For more information and cost comparisons — write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

ANACONDA® **COPPER TUBE AND FITTINGS for soil, waste and vent lines**

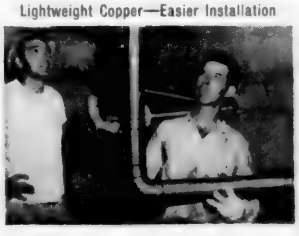
Available through plumbing wholesalers. Products of The American Brass Company

Longer Lengths—Few Joints

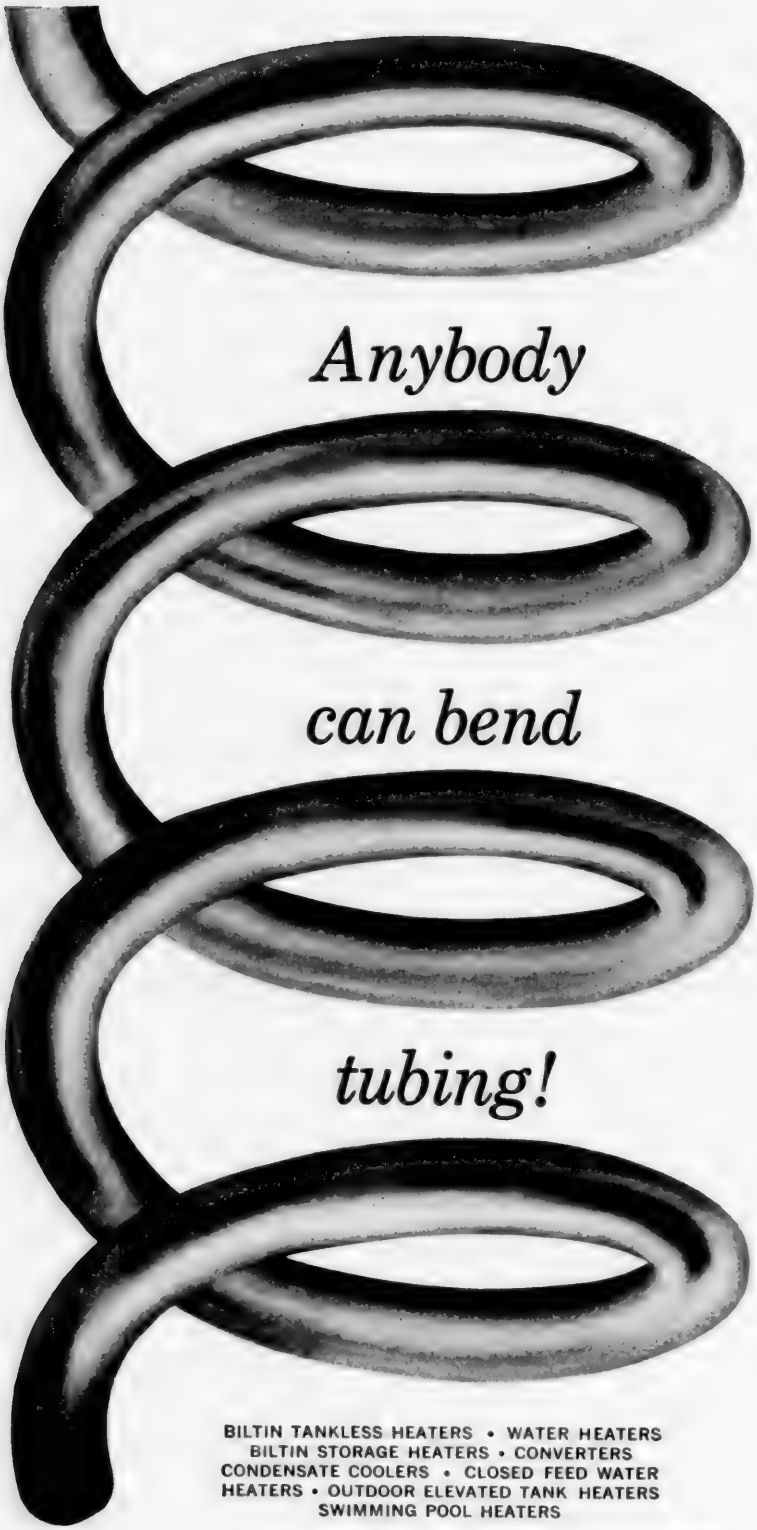
Preassembly—Saves Time



Lightweight Copper—Easier Installation

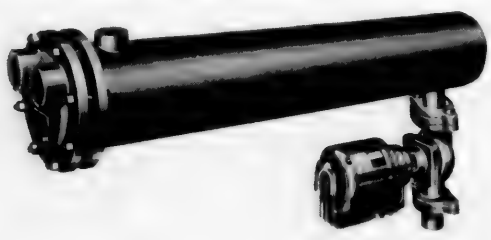


Compact Connections—Save Space



Anybody can bend tubing!

BILTIN TANKLESS HEATERS • WATER HEATERS
BILTIN STORAGE HEATERS • CONVERTERS
CONDENSATE COOLERS • CLOSED FEED WATER
HEATERS • OUTDOOR ELEVATED TANK HEATERS
SWIMMING POOL HEATERS



Let's face it. Most of today's industrial and commercial heat exchangers are basically alike — coils of copper tubing surrounded by a shell. So — what's different about TACO Heat Exchangers?

THREE BIG THINGS

FIRST: For every heat exchanger installation, TACO also makes a circulating pump and other accessories. You're sure of a perfectly matched, perfectly balanced system . . . available from a single source.

SECOND: *Behind* every TACO heat exchanger there are over forty years of engineering and manufacturing experience. *Inside* every TACO heat exchanger *better* design features. For example, all head flanges and bolt hole dimensions meet ASA standards. All are ASME constructed.

THIRD: TACO covers practically every requirement in the commercial and industrial fields. Whether the job is warming swimming pool water or service water heating — heating radiation, or cooling steam condensate, there's a TACO exchanger to do it. And whether the heat source is liquid or vapor, you get the *most* out of it.

These are the reasons why TACO heat exchangers are a popular choice throughout the plumbing, heating, and air conditioning fields. The TACO Catalog on Commercial and Industrial Heat Exchangers would be a great help on *your* next installation. For a copy, write TACO HEATERS, INCORPORATED, 1160 Cranston Street, Cranston 9, R. I.

Taco

SERVING THE HYDRONIC INDUSTRY
SINCE 1920

Handling Hot Fumes? Bifurcate 'em!

A protective housing shields a DEBOTHEZAT Bifurcator motor from contact with hot and corrosive fumes. Special alloys for housings and fan wheels are available for extremely corrosive fumes. The result: smoother operation and lowered motor maintenance costs. In-the-duct installation of DEBOTHEZAT Bifurcator Fans saves valuable space and ends sharp-corner deflection of exhaust flow. Friction is reduced and velocity increased.

Direct-drive DEBOTHEZAT Bifurcator Fans economize fume removal problems in a wide variety of applications. Contact a DEBOTHEZAT engineer now or write Dept. ACH-560.

De Bothezat® FANS

A DIVISION OF

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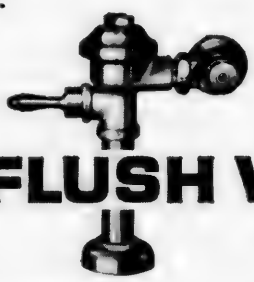
You pay no more for unequalled SLOAN quality...

5 good reasons WHY your choice should be ROYAL

The Sloan ROYAL Flush Valve is the standard of comparison by which all other flush valves are judged. Only the ROYAL provides all of the quality features demanded in modern flush valves, which are—

- **Segment Diaphragm** • Natural rubber vulcanized to brass reinforcements affords added strength and provides extra-long service life
- **Inside Cover** • Not only protects, but controls the flexing action of the diaphragm—while in cooperation with the outside cover, it makes a stronger union of both body and cover
- **No regulation** • A uniform flush every time with nothing to get out of order, means service and water economy you can take for granted
- **Non-hold-open** • A Sloan Royal will complete its cycle and shut off automatically, whether the handle is held or released—another important water saving feature
- **Double-handle openings** • Concealed Royals rough-in either right hand or left hand. This flexibility solves unforeseen problems on the job

These are the quality features which account for the ROYAL's overwhelming popularity, and sustain its leadership as the Flush Valve of universal preference. They are further examples of that bonus of quality you expect from Sloan. And, since you can have Sloan quality at no extra cost, why not make sure you get it.



SLOAN FLUSH VALVES

SLOAN VALVE COMPANY • 4300 WEST LAKE STREET • CHICAGO 24, ILLINOIS

FLEXIBLE AND VERSATILE
RUGGED AND RELIABLE

McQuay offers you more flexibility and versatility with the "HC" heating and ventilating units.

Rugged "V" channel frame construction with continuous galvanized steel panels, bonderized and oven baked enamel coated, gives you the finest quality available anywhere.

McQuay "HC" heating and ventilating units may be selected in either horizontal or vertical types in 19 sizes ranging in capacity from 1280 cfm to 48,330 cfm. Eight capacity ranges are available with standard steam, jet tube steam or hot water coils. You can choose from eight fan discharge arrangements and 18 accessories arrangements designed to fit your individual needs.

For the greatest reliability, for the greatest possible flexibility and versatility, buy McQuay. There is a McQuay representative in or near your city, or write McQuay, Inc., 1619 Broadway Street N. E., Minneapolis 13, Minnesota.

McQuay "HC"

McQuay "HC" horizontal heating and ventilating unit. Available in three types of coils; standard steam, jet tube steam and hot water.

McQuay "HC" vertical heating and ventilating unit. Also available in three types of coils. A full line of accessories is available for all models.

TV Means Quality

McQuay INC.

AIR CONDITIONING • HEATING • REFRIGERATION

Builder: Turner Construction Company. Architects & Engineers: Voorhees Walker Smith Smith and Haines. Mechanical Contractor: Lloyd E. Mitchell, Inc. Pipe Jobber: Lee L. Dopkin, Inc., of Baltimore. Owners: Sinai Hospital of Baltimore, Inc.

Dedicated to Longevity

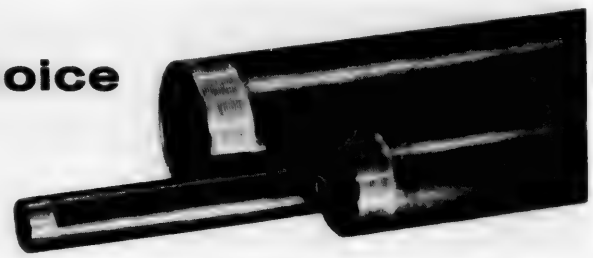
BOTH THE HOSPITAL... AND ITS STEEL PIPE

Name:	The new Sinai Hospital
Location:	Baltimore, Md.
Dedication:	September 20, 1959
Capacity:	483 beds
Floor Area:	600,991 sq ft
Cost:	$20,000,000

Name:	Bethlehem general-purpose steel pipe
Location:	Plumbing and heating lines
Quantity:	300 tons
Sizes:	2 through 4 in. continuous buttweld pipe 5 through 16 in. electric resistance-weld pipe
Cost:	Lowest of all piping materials

Steel Pipe is First Choice

FOR LASTING STRENGTH...
ECONOMY...WORKABILITY



Insist On Steel Pipe Made in USA

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Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

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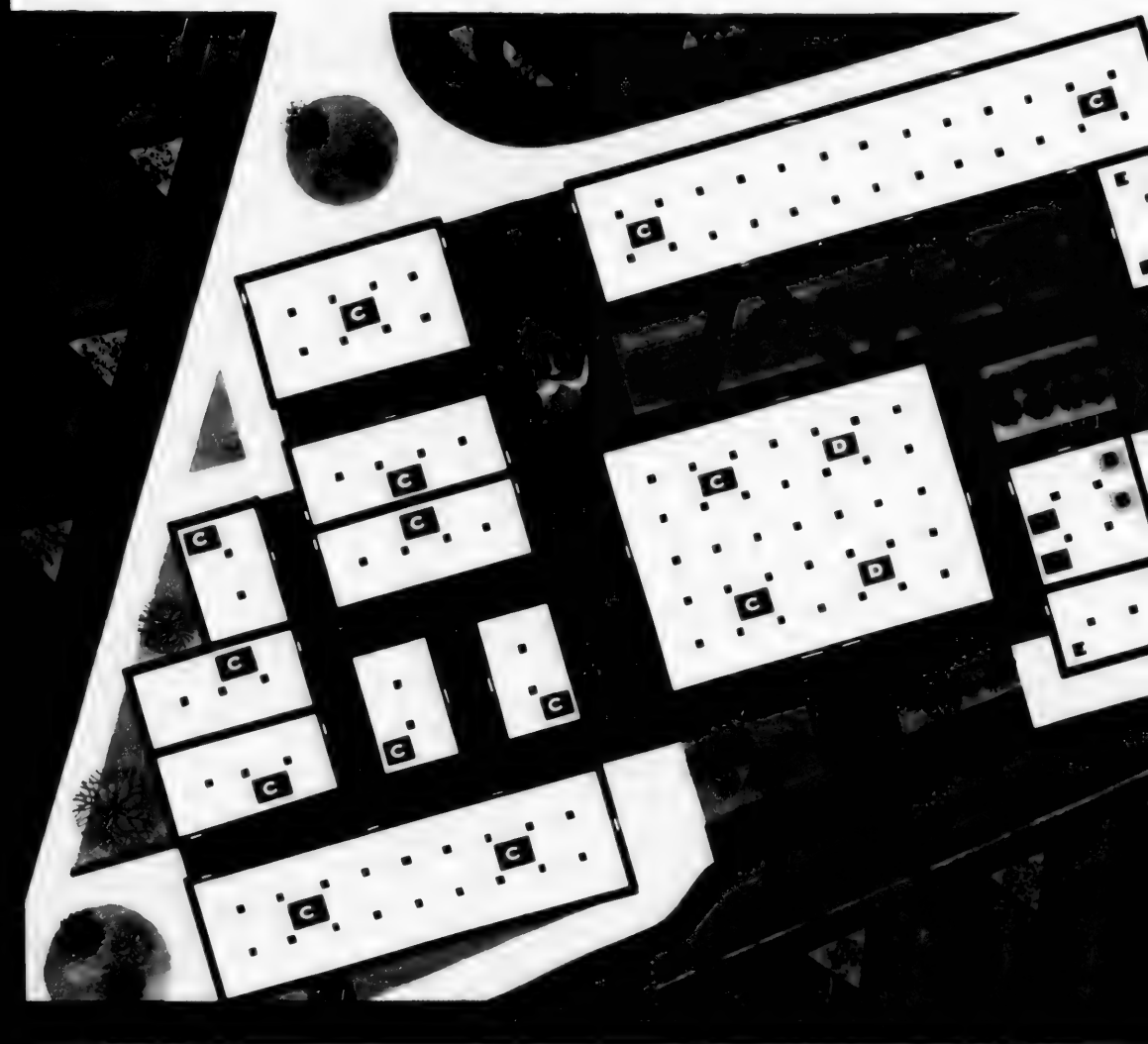
AIR-LIFT† FOR MODERN SHOPPING CENTERS

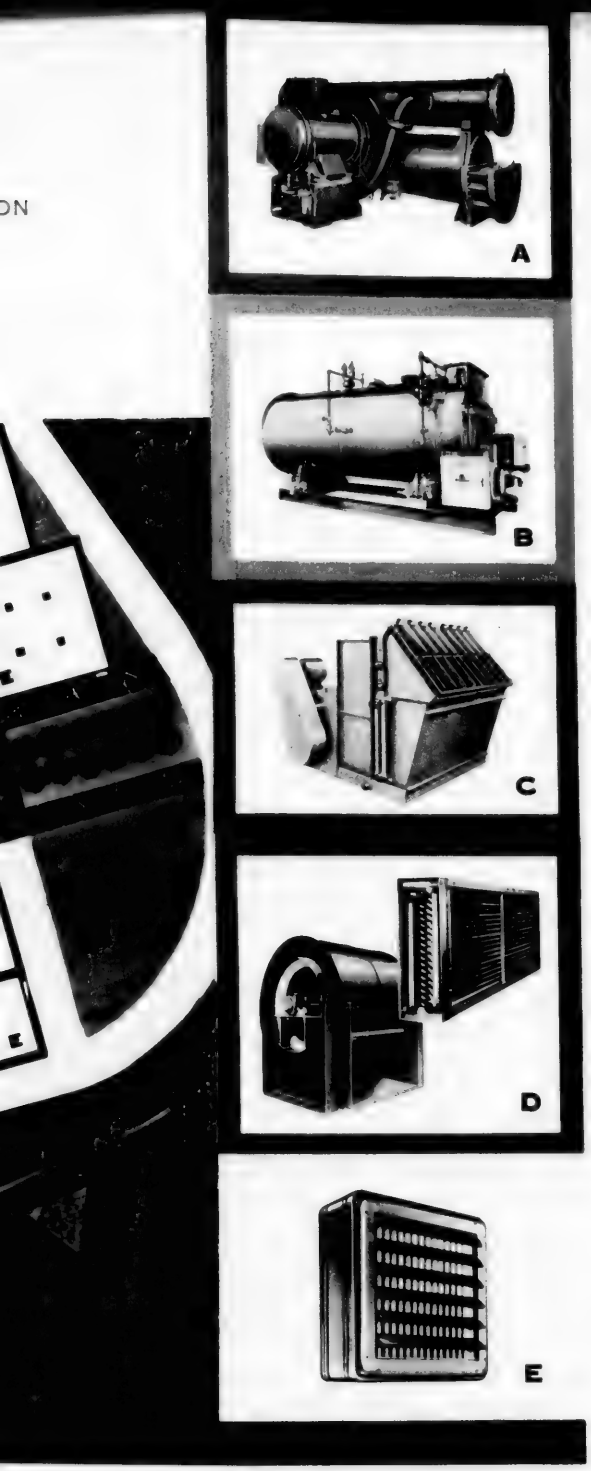
Air-Lift, a new concept of coordinated products and services from American-Standard Industrial Division, helps you boost the selling efficiency of modern shopping centers through better indoor climate control. Air-Lift gives you one-source responsibility for air-conditioning, heating, and ventilating equipment designed and manufactured to work together.

LIFT THE FLAP

†Service-mark of American Radiator & Standard Sanitary Corporation. Copyright 1960, American Radiator & Standard Sanitary Corporation

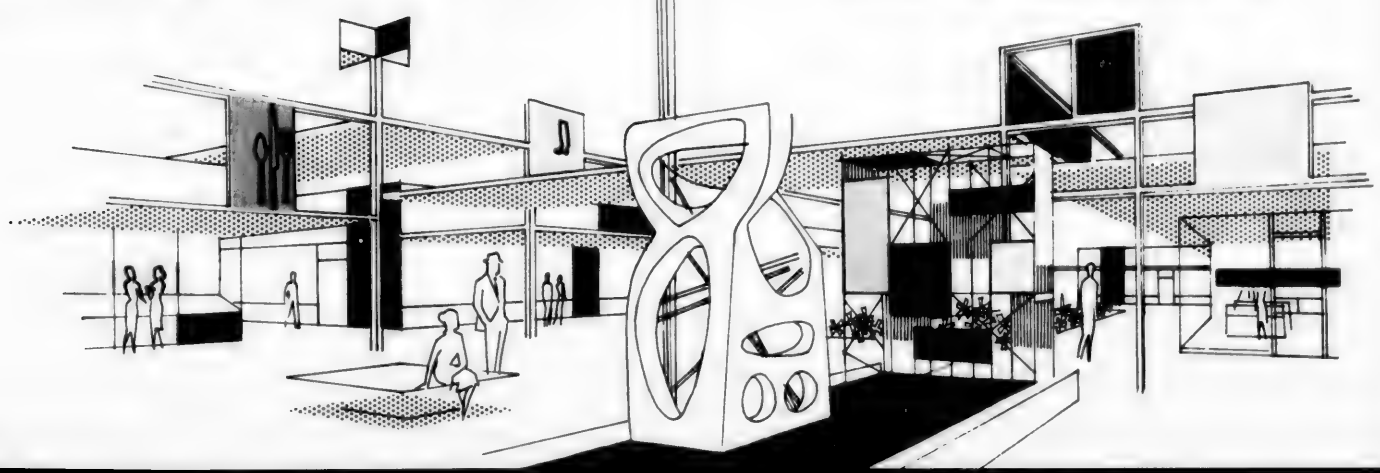
AMERICAN-STANDARD INDUSTRIAL DIVISION AIR-LIFT IN ACTIO





AIR CONDITION A CITY OF STORES WITH EQUIPMENT FROM A SINGLE SOURCE

You'd be surprised at the convenience—working with American-Standard Industrial Division from the planning stage on. You look to one company for your total requirements for air-conditioning systems of any size or degree of complexity . . . whether you need package units, multi-zone air conditioners, fans, or centrifugal refrigerating machines or boilers. You talk to product specialists who speak your language—know what their equipment can and can't do. Fewer interviews. Fewer call-backs. One source responsible for equipment quality, delivery dates, and service.



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Heating	Firebox, Scotch-Type, and Package Boilers • Steam, Hot-Water, and Gas-Fired Unit Heaters Heating and Ventilating Units • Heating Coils • Cabinet Heaters • Industrial Heaters
Ventilation	Centrifugal Fans • Propeller Fans • Axial Fans • Power Roof Ventilators • Utility Sets Specialized Fans and Blowers
Service-Water Heating and Flow Control	Instantaneous Water Heaters for service-water, booster, or convertor duty • Gyrol® Fluid Drives to drive water-service pumps—eliminate compressed-air system or roof tank

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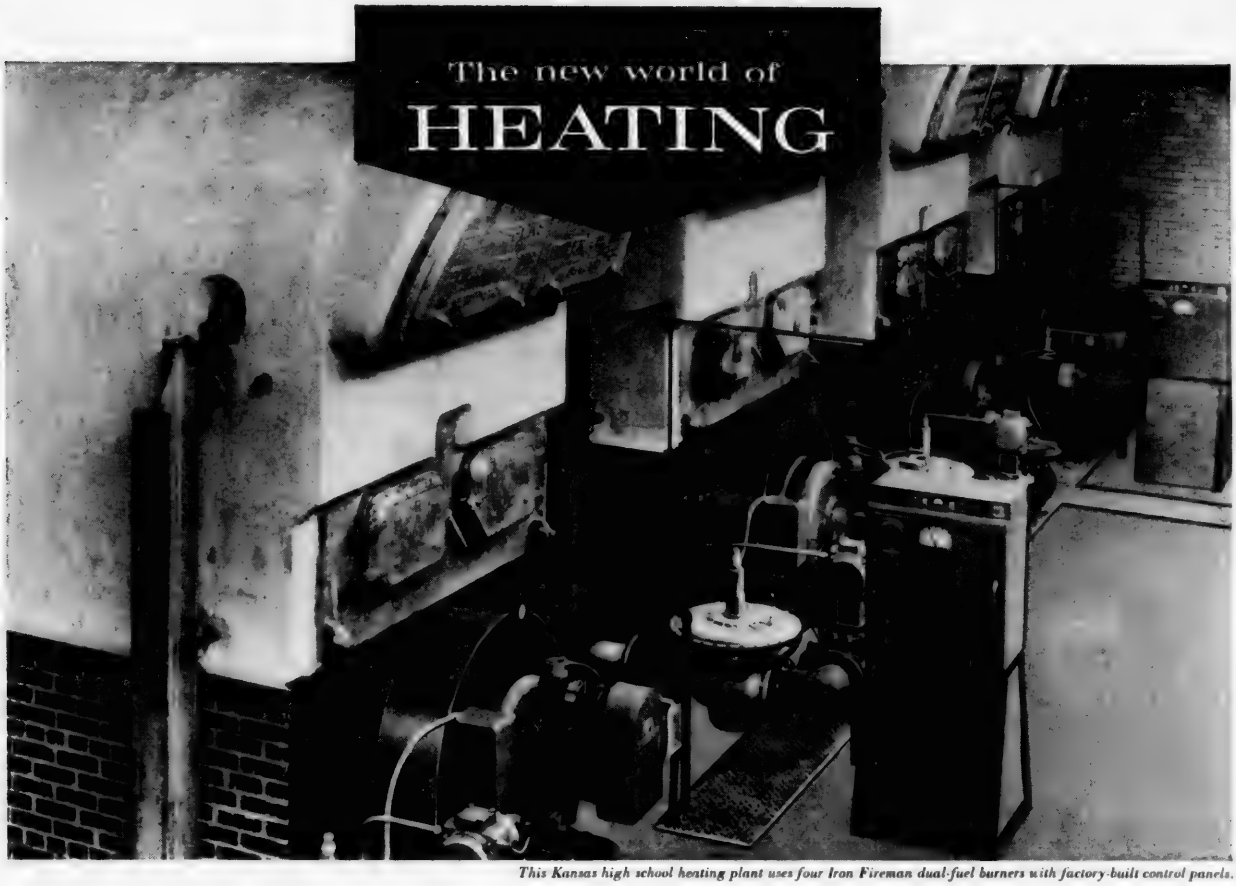


This Kansas high school heating plant uses four Iron Fireman dual-fuel burners with factory-built control panels.

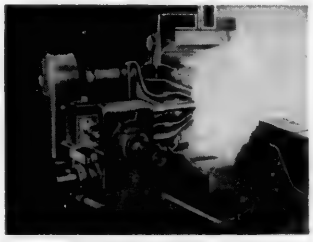
Add high efficiency firing *without boiler alteration*

Factory engineering replaces local "cut and try" firebox design

The Iron Fireman AirRing* dual-fuel burner (shown in the high school heating plant above) is a complete factory built package that is simply bolted to the boiler front.

The package includes both primary and secondary air systems, combustion safety controls, ignition and fuel systems for either one or two fuels, and factory-engineered refractory combustion throat.

This compact unit not only reduces on-the-site construction, but achieves superior performance by supplementing local craftsmanship with experienced application engineering. Complete combustion is accomplished without flooding the firebox with excess air.



This cutaway shows how oil, gas and air are introduced into the combustion chamber through a single firing port. No checkered floor, firing arch or boiler pit. Flame is generated within a cone of air—no inefficient infusion of underfloor air.

**Trade-Mark*

Mail coupon for full information and specifications.

IRON FIREMAN

HEATING AND AIR CONDITIONING
AIRCRAFT COMPONENTS AND EQUIPMENT
MISSILE AND AIRPLANE GYROSCOPES
ELECTRONIC EQUIPMENT
CONTROL INSTRUMENTS

Iron Fireman Mfg. Co., 3085 W. 106th St., Cleveland 11, Ohio
(In Canada, 80 Ward St., Toronto)

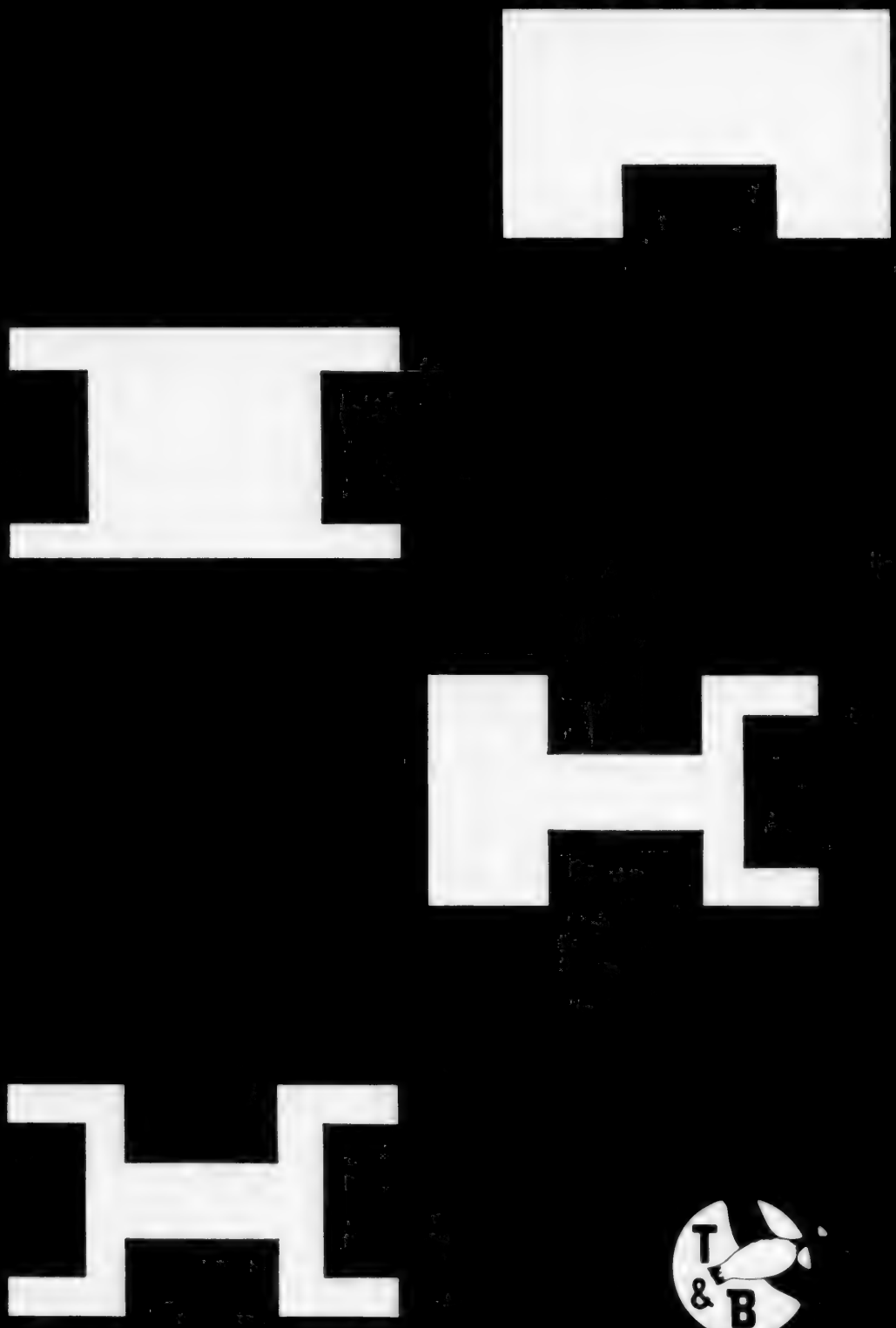
Please send complete technical description and specifications on Iron Fireman AirRing firing.

Name_____

Firm_____

Address_____

City_____ State or Prov._____

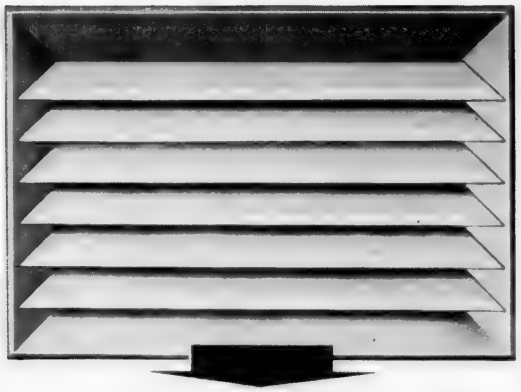


TYPE M

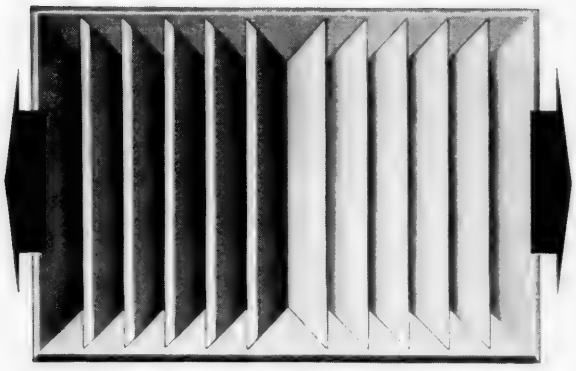
Multi-Pattern Diffusers

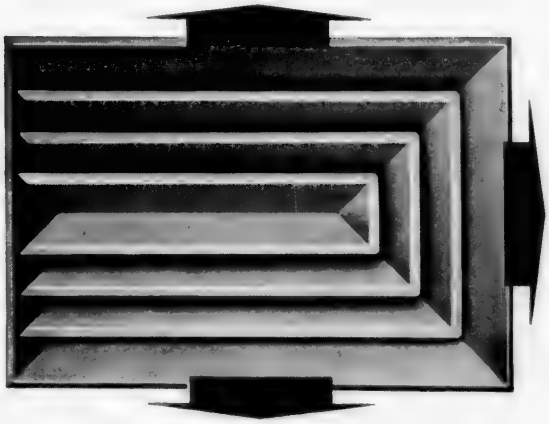
The extreme flexibility of **Type M Multi-Pattern Diffusers** *means custom-selected air distribution*

TYPE M 1-WAY BLOW

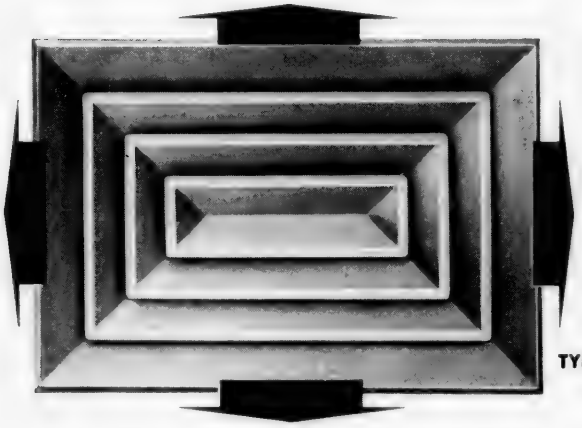


TYPE M 2-WAY BLOW





TYPE M 3-WAY BLOW



TYPE M 4-WAY BLOW

Ideal conditions for the placement of ceiling diffusers do not always exist. Walls, partitions, exposed beams, supporting columns, light fixtures . . . big offices, small offices, corridors . . . are some of the factors that can contribute to the problem of correctly selecting and locating air distribution outlets.

With Tuttle & Bailey Type M Diffusers . . . you can select units that will distribute air in a one-, two-, three-, or four-way pattern . . . and you can select from a wide range of square and rectangular sizes. An added advantage . . . if and when requirements change in the conditioned space, it is an easy matter to install a core with a different air pattern arrangement.

T & B Type M Diffusers are attractively styled and can be furnished with four margin styles . . . beveled, flat, flush, or drop-collar . . . designed for various types of ceiling mountings.

For complete details, see your nearest Tuttle & Bailey Representative or write us direct.

TUTTLE & BAILEY

division of Allied Thermal Corp. New Britain, Connecticut

Tuttle & Bailey Pacific, Incorporated, City of Industry, California

BETTER LI

BORG-WARNER'S BETTER LIVING KITCHEN FOR 1960. Norge's new Never-Frost refrigerator ends the nuisance of defrosting forever—even in the freezer section. In Norge's built-in wall oven, you can broil and bake at the same time. The cook is always in command with the Custom Control Panel of the Norge counter-top range. Brightening this workaday world is color—coordinated, too, in the spacious Ingersoll-Humphryes sink. And a York air conditioner and KoolShade sun screens keep the kitchen comfortable, 'round the clock and 'round the calendar.

VING

BY BORG-WARNER

A report on the far-reaching ways in which a dynamic corporation helps enrich the lives of millions

The modern refrigerator has made a museum piece out of the old-fashioned icebox. Heating a home once involved manual labor, now requires only the touch of a thermostat. Gone are legs on bathtubs. Hand fans of yesteryear have given way to the fingertip-controlled air conditioner. And down are many clotheslines—replaced by automatic dryers.

Who wrought the revolution? The divisions and subsidiary companies of Borg-Warner Corporation helped importantly by developing new and better home equipment.

The Norge refrigerator was *first* with adjustable swing-out shelves—*first* with an automatic ice cube maker, in both gas and electric models. The *first* successful home air conditioner went down in history with the York name on it (1935)—leadership evident today in York's new Heat Pump that warms and cools by using only outside air and electricity. The three newest ideas in residential plumbing fixtures are *all* products of the Ingersoll-Humphryes Division. The *original* multiple-layer aluminum foil insulation is Alfol, and the *original* solar screening is KoolShade—both products of Reflectal Corporation, a B-W subsidiary.

Rest on laurels? Never. At the Roy C. Ingersoll Research Center in suburban Chicago, Borg-Warner is forever designing, testing, analyzing—creating equipment destined for homes of the future.

B-W

The 7 Hats of Borg-Warner . . . (top) national defense; oil, steel and chemicals; (middle row) agriculture; industrial machinery; aviation; (bottom) the automotive industry; home equipment.

BORG-WARNER

It's a better product when Borg-Warner makes it

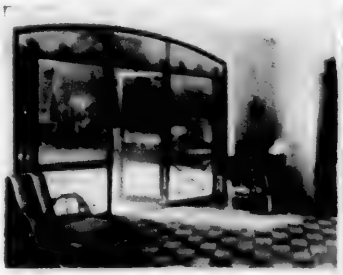
Borg-Warner Corporation • 200 South Michigan Avenue • Chicago 4, Illinois

COLOR MAGNIFICENCE is yours in B-W's Ingersoll-Humphryes cast iron, steel and china residential plumbing fixtures. Available in six pastels, including three 1960 House & Garden Magazine selections, plus white.

A SINGLE OPERATION washes, rinses, fluff-dries in Norge's gas or electric Washer-Dryer Combination (also washes or dries separately). One setting washes synthetics safely; another gets denims perfectly clean.

A MIDSUMMER NIGHT'S REST is assured in a bedroom cooled by "library quiet" York air conditioning, install-it-yourself window model or central system. Dial choice of comfort level; York maintains it automatically.

LIFT FOR LIFE. York Comfort Center heats and humidifies in winter, cools and dehumidifies in summer—purifying air electronically. Two flames of gas-fired furnace heat more efficiently than one—yet do not use more fuel.



SUMMER COMFORT: KoolShade sunscreen by B-W's Reflectal Corporation blocks sun's hottest rays (note contrast where door is open!), keeps porch, house up to 15% cooler, glare-free—yet permits complete visibility.

BUILDING OR REMODELING? Reflectal's Alfol Aluminum Foil Insulation is clean to work with, easy to install. Reflects summer heat out, makes homes 15° cooler—reflects winter heat in, cuts fuel bills as much as 35%.

Also serving homeowners is the B-W Acceptance Corporation, with offices in principal cities, which finances appliance purchases to suit your budget.

WHAT BORG-WARNER MEANS TO YOU!

Many Borg-Warner products contribute essentially to your well-being. The preservation and preparation of food, for example. Others add immeasurably to comfort and security, like heating and cooling of your home. Still others, such as automatic washers and dryers, free the homemaker for more happy moments with her family. A state of well-being, an air of security, an atmosphere of happiness—these, then, are the "by-products" of products made for the home by Borg-Warner.

Now—a new appearance concept for low-budget commercial installations

The "Power-Plant" Look

with Johns-Manville FIBROCEL Insulation!

Now you can bring the traditionally fine appearance and performance excellence of your power plant work to general commercial and industrial installations... with Johns-Manville Fibrocel® Insulation!

Why these power plant advantages? Simply because Fibrocel is molded! The only commercial insulation made (by a precision metal mold) to near-perfect roundness, with unmatched uniformity of size and line.

This means an immediate end to costly finishing, heavy jacketing, needless pointing up of cracks and apertures. Instead, Fibrocel gives you a tighter, better looking installation just as it is applied. Pipelines are gun-barrel straight, firm end to end. The look of a power plant!

Fibrocel's dimensional uniformity again pays off in fuel savings—pipe is always "dead center," with lengths butted tight to provide maximum insulating effectiveness.

Let us send you the informative new brochure, IN-155A. It gives you full details on Fibrocel's thermal performance. Illustrations show why Fibrocel installs easier . . . takes abuse, too. Keeps its fine appearance and performance excellence for the life of the installation. Write for it today!

Address Johns-Manville, Box 14, New York 16, N.Y. In Canada: Port Credit, Ontario.

JOHNS-MANVILLE PRODUCTS

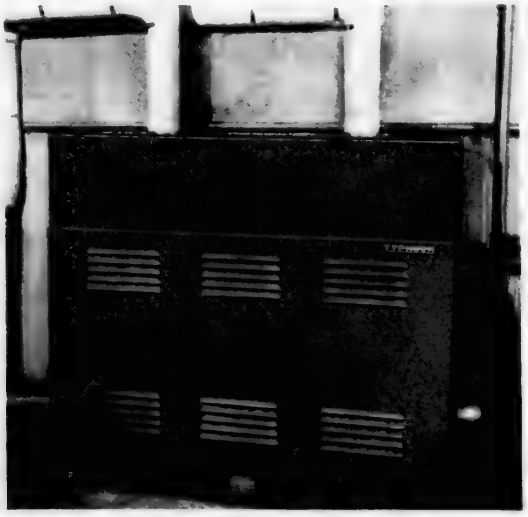
JOHNS-MANVILLE

...Specify Fibrocel for the "POWER PLANT" look in installations like these (35F to 300F)

HOSPITALS
INSTITUTIONS

FLEXIBLE TYPHOON PACKAGE UNITS SOLVE HOTEL'S COOLING PROBLEMS

New York's Warwick Reports Operating Costs Cut 33-50%



(ILLUS. 1) Three 8 ton units were installed—one for the second floor public room lobby and one for the Pine Room—the other for the Walnut Room. Two of these units were installed in the rear of the coat room serving this area, one was installed in the space next to the bar serving the Pine Room. The 20 ton unit was installed in the pantry next to the Warwick Room. Two 30 ton water towers were installed to provide condenser cooling water for the new package installation. (ILLUS. 2) A new 15 ton Typhoon package water chiller was installed operating on the old system with new controls, coils and piping to care for the smaller private dining rooms on the same floor. New individual smoke exhaust units were installed in each of the three rooms.

Talk about problems! The Warwick cooled 80 bedrooms and 5 public rooms with a central chilled water system. There were no individual temperature controls. The same coils were used for heating and cooling. During chilly spring or fall days, the bedrooms needed heat while the public rooms needed cooling. Even when only one public room was open, all five had to be cooled. Results: high operating costs; dissatisfied guests.

SOLUTION: Four Typhoon package units, to provide individual cooling and heating systems for the public rooms. Each unit was furnished with steam coils in the air discharge plenum, which were connected to the existing building heating system. A complete new duct layout was installed to improve air distribution. The bedrooms were then more efficiently served by the old system. ALL THIS WITHOUT USING INCOME-PRODUCING SPACE, THANKS TO THE COMPACTNESS OF TYPHOON UNITS. Operating Savings: 33 to 50%.

CONCLUSION: No matter how unusual or difficult your requirements may be, you can rely on Typhoon flexibility to fill the bill best at lowest possible price. For more information on the industry's most complete line of air conditioners, write today. Get your free copy of the 20" x 28" Reference Chart of the broad Typhoon line.

TYPHOON

HUPP Corporation

TYPHOON AIR CONDITIONING DIVISION, HUPP CORPORATION 2-E
505 Carroll Street, Brooklyn 15, N. Y.

☐ *Please send Reference Chart and full product literature.*
☐ *Please have representative call for appointment.*

NAME_____

FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Just 75 years ago, heating was about as unpredictable as the weather, as temperatures alternated between shivery low and smother-high. Then a Wisconsin schoolteacher named Johnson decided to do something about classroom comfort and thereby launched a new industry!

The Story of the Thermostat

Actually this is the story of a symbol . . . the symbol of an industry that has brought comfort, safety, better health, and efficient working conditions to people all over the world.

. . . In a specially equipped manufacturing plant, delicate missile parts and components, with micro-inch tolerances, must be made under temperature and humidity conditions that never vary. At every step in their manufacture, modern pneumatic controls assure error-free regulation of the thermal environment.

. . . In a hospital, surgeons perform a lifesaving operation. Accurate pneumatic controls maintain the temperature and humidity at preselected levels to conserve the patient's strength during surgery.

. . . Every morning of the school year, millions of students sit down to study and learn in comfortably heated and ventilated or even air-conditioned classrooms. To help provide this ideal environment, the great majority of schools and colleges everywhere depend on precision pneumatic control systems.

. . . Far at sea, one of the nation's deadly new submarines cruises undetected, an elusive, power-laden sentry of the "Silent Service." Her crew lives and works in comfort and safety — in a climate precisely regulated by a pneumatic control system.

. . . Across the continent, pneumatic controls assure safe air conditions in the highly critical processing areas of an atomic energy facility. Pneumatic controllers of extreme sensitivity operate constantly to assure safe disposal of waste air and prevent the escape of contamination.

These are but a few examples of the ways in which modern pneumatic controls play a vital part in regulating the environment in which we live and work — helping to create made-to-order indoor climate for every purpose, controlling temperatures and humidities to a degree undreamed of when Professor Warren S. Johnson invented the first automatic temperature control system back in the 1880's.

Inventor at Work

Though he was probably unaware of the fact at the time, Professor Johnson became the founder of the automatic temperature control industry when he devised a practical way to eliminate the problem of classroom temperatures that seemed to zigzag forever between shiver and swelter.

His first attempt at control — the "annunciator" system — merely called the janitor's attention to overheating, or lack of heat, by ringing a bell in the furnace room. The janitor would then open or close the classroom dampers, as required.

But this land-based version of a ship's telegraph soon gave way to an all-electric method, utilizing a thermostat in each room that would open and close the dampers automatically. And so, the first system of automatic heat regulation was born.

The Electro-Pneumatic System

Intrigued with the possibilities of his long-awaited discoveries, Professor Johnson in 1883 left his post at Whitewater, Wisconsin, State College and came to Milwaukee to devote full time to refining and marketing the Johnson System.

His second major achievement, an electro-pneumatic control system, occurred almost at once. By successfully uniting the forces of *electricity*, for thermostat operation, and *compressed air*, for valve and damper operation, he developed a far more dependable and fully automatic control system. Finally he was ready to go out and revolutionize the comfort standards of the world. In 1885, he incorporated the business which today bears his name.

With branches established in Chicago, St. Louis, and New York, the Johnson thermostat on the wall soon became a familiar sight in the leading buildings of the day. Schools, prominent residences, and small business buildings were first to enjoy the comforts and economies of automatic control. They were followed closely by colleges, hospitals, public buildings, offices, stores, and industrial plants.

From Mikado to Czar

Acceptance grew, markets widened. The fame of automatic controls traveled fast and far. Before 1890, the city of Berlin, Prussia, had written a report about the efficiency of its Johnson System. Later, the palace of the Mikado in Japan was equipped with Johnson Control. The King of Spain and other European royalty became Johnson customers. A special installation was made in the Kremlin in Moscow!

Single Responsibility

Professor Johnson had the foresight to realize that the key to his success depended upon the *proper application* of his controls. Accordingly, he determined, from the outset, that his company should *never sell devices,* but should sell a *principle of control.* This meant that each system would have to be planned, manufactured, installed, and serviced *by Johnson* to meet the exact needs of the individual building.

Over the years, this policy of complete responsibility by a single specialized organization has insured owner satisfaction and saved untold millions of dollars for Johnson customers.

Carrying out this policy has also resulted in the closest possible working relationship between the Johnson organization and the nation's consulting engineers and architects, in a joint effort to provide ever better control of thermal conditions.

Many Johnson "Firsts"

The history of the thermostat and the Johnson Service Company coincides with the period when other pioneers were busy introducing innovations in heating, cooling, and ventilating methods and in developing full-scale air conditioning. Working closely with the research staffs of these manufacturers, Johnson engineers were able to supply the most effective controls for every new development in basic equipment. This cooperation has continued and flourished to the present.

Over the years, the Johnson Service Company has been the source of a never-ending flow of new ideas, which have included virtually all of the key developments in the field of automatic temperature control!

By far the most important was the all-pneumatic control system, perfected in the 1890's and still the standard everywhere. Others include the all-metal thermostat, the famous *Dual* or day-night thermostat, the heating-cooling thermostat, summer-winter thermostats, the airstream thermostat, master-submaster thermostats, supersensitive gradual-acting thermostats, and powerful piston damper operators.

Another famous development was the Humidostat or humidity regulator. And, of course, the Comfostat, an exclusive Johnson instrument that controls room temperatures in relation to humidity conditions. The popular pneumatic control center, for centralized supervision and control of modern air-conditioning systems, also was first perfected by Johnson.

Uninterrupted Progress

As the concept of controlled environment gathered momentum, so did Johnson. Important "firsts" became routine jobs, as the industry looked to Johnson for the answers to new control problems. From the simple comfort needs of the buildings of the 80's and 90's, to the history-making demands of the first scientifically air-conditioned building, down to the most complex requirements of today's commercial and industrial buildings, Johnson has been the leader in the pneumatic temperature control field.

Today, wherever you go, you'll find the important buildings are equipped with Johnson Control. From the fabulous Fontainebleau Hotel to the mammoth Merchandise Mart to the famous UN Secretariat Building . . . in schools, hospitals, sprawling defense plants, research laboratories, vital military installations, shopping centers, in buildings of *every* size and type and in ships at sea . . . there are temperature and air-conditioning control systems by Johnson.

Johnson Today...and Tomorrow

To make certain that each installation performs up to expectations, Johnson backs its engineers with the most complete line of pneumatic temperature, humidity, and pressure control equipment in the industry.

To serve you most efficiently both before and *after* a sale, Johnson maintains the largest and most experienced field organization in the industry, with 107 completely staffed branch offices in the United States and Canada, plus full-time, factory-trained installation and service mechanics in over 200 other cities.

This is by no means the end of the story of the thermostat. For against this unmatched background of innovation, experience, and service, Johnson's never-ending search for new and better controls will inevitably lead to dramatic new ideas in the years ahead. As the day of completely air-conditioned cities approaches and as new and unprecedented demands for precision controls evolve, the forward-thinking Johnson organization will always be ready with the right answers.

The Johnson research and development staff and facilities have been expanded three times in the past four years. And final plans for the next major expansion are already underway! In the future then, as in the past, you can continue to look to Johnson for the world's finest controls!

Johnson Service Company, Milwaukee 1, Wisconsin. In Canada: Johnson Controls Ltd., Toronto 16, Ontario.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

AD 1073

Printed in U.S.A.

13 years of use-and-abuse prove there's no insulation quite so rugged as ULTRALITE

ULTRALITE was the first lightweight, low-density glass fiber insulation—and is still the only insulation made exclusively of long, strong, textile-type glass fibers. Since it was introduced to industry in 1947:

It has been widely used as duct insulation and liner, metal building insulation, acoustical baffles, and in baby buggies, aircraft, typewriters, ships, trucks, automobiles, washing machines, hot water heaters, and curtain walls, to name but a few uses.

It has, in the course of all this service, been pulled, pinched, pummeled, gouged, compressed, kicked, sat upon, trampled, exposed to frigid and torrid temperatures, vibrated mercilessly, immersed in water, and otherwise subjected to all the mechanical abuse that can arise out of shipment, storage, handling and application.

But all this hasn't mattered, because ULTRALITE is the super-strong glass fiber insulation. Come what may, it does not shake down, dent, settle, flake, pack down, rot, corrode, mildew, tear, dissolve, or otherwise lose its original thickness and density. As the photos suggest, it is **1** super-tough, **2** pleasant to handle, **3** unaffected by water, **4** outstanding in thermal efficiency, and **5** unusually resilient, always springing back to original thickness when compressed.

All these extras cost you and your customers not a penny more. Next time you need glass fiber insulation, get the most for your money by calling your nearby ULTRALITE distributor.

FOR NAME OF YOUR NEAREST DISTRIBUTOR SEE YELLOW PAGES

GUSTIN-BACON Mfg. Co. gb

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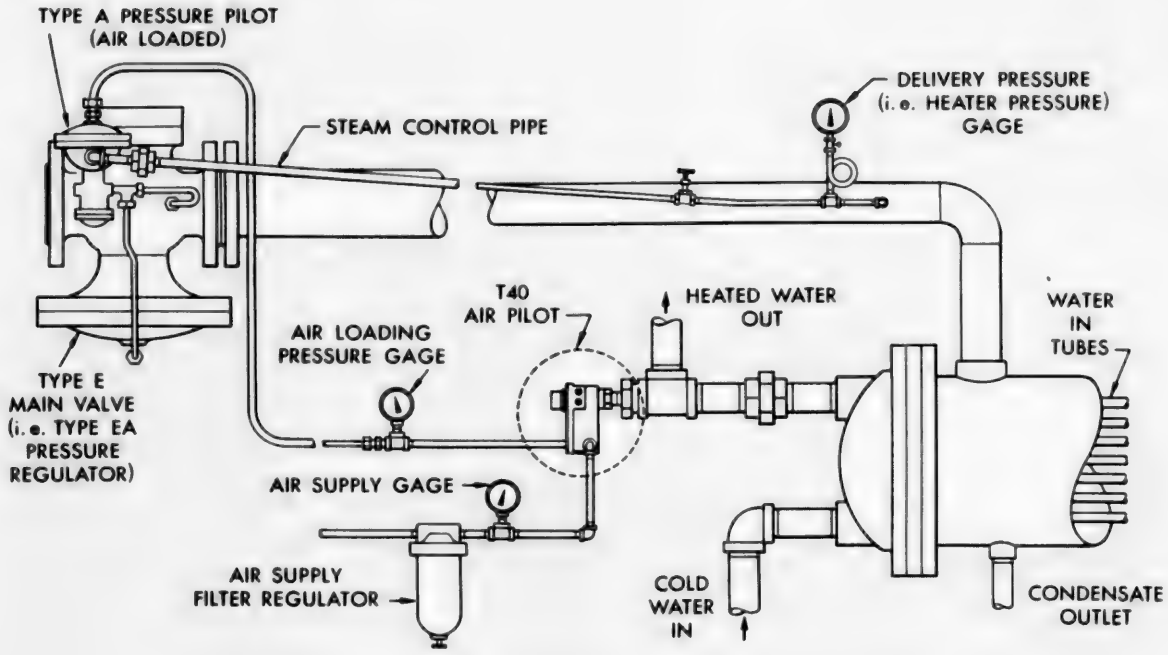
Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation . . . Couplings and fittings for plain and grooved end pipe.

New Spence Temperature Control System Gives Unusual Control Accuracy



TYPE EAT40 AIR-CONTROL TEMPERATURE REGULATOR (Patent Pending)

In a recent installation the new Spence air-control temperature regulating system provided:

- ±5°F control accuracy under wide and instantaneous load swings of 210 to 80 gallons per minute.
- Up to 50% reduction in cost as compared to instrument systems of similar accuracy.

This unique cascade-type control with throttling range adjustment independent of maximum heater pressure was developed to meet today's demand for greater control accuracy.

Additional features of the new Spence Temperature Control System include:

- 200°F wide adjustable temperature range
- Adjustable speed of steam pressure change
- Over and under temperature protection
- Pressure limit control
- Fast response
- Very low air consumption
- Field reversible for heating or cooling

The Spence Type EAT Air Control Temperature System, when properly installed, will tame wide ranging, fast changing loads of instantaneous heaters and modern heat exchangers. The cascade principle plus the use of an extremely fast responding bi-metal temperature sensing element reduce time lags and provide control stability.

Here's how the new Spence system operates:

Quick response is based on a bi-metal temperature sensing element.

Temperature pilot continuously regulates a loading air pressure.

This loading signal, when applied to a pressure regulator to reflect heater temperatures, causes it to adjust the main valve as changes in load require.

Spence has also developed a new pressure control system based on this same cascade principle. This system has a control accuracy of ½ psi or better from positive pressures through the vacuum range to 30" Hg.

For complete information on these new air controlled temperature and pressure control systems, write for your copy of Bulletin 9.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

SE-140

BLH-
EFFICIENT AIR MOVER FOR YOUR
HIGH PRESSURE SYSTEMS

Since the finest air conditioning system available is no better than the fan that powers it, the Buffalo Type BLH Fan merits your most serious consideration.

The BLH is a better fan for your high-pressure system. It's a heavy-duty fan for Classes III and IV service. It offers the highest efficiency over the broadest range. In addition to the quietest, smoothest air ride from inlet to outlet (thanks to curved inlet bell, inlet guide vanes, inlet wheel flange matching the curved inlet bell, backward curve blades and graduated housing) it has the unique Buffalo divergent outlet providing smooth outlet flow and high static regain. For efficiency at high pressures, the BLH is without equal — and for dampered operation, Buffalo Variable Inlet Vanes can be substituted with less than 1 percent reduction in catalog rating; performance that cannot be equalled by conventional variable vane design.

Bulletin F-200 contains performance, construction, capacity and dimensional details. Your copy will be mailed promptly on request.

BUFFALO FORGE COMPANY • BUFFALO, NEW YORK

Buffalo air handling equipment to move, heat, cool, dehumidify and clean air and other gases.

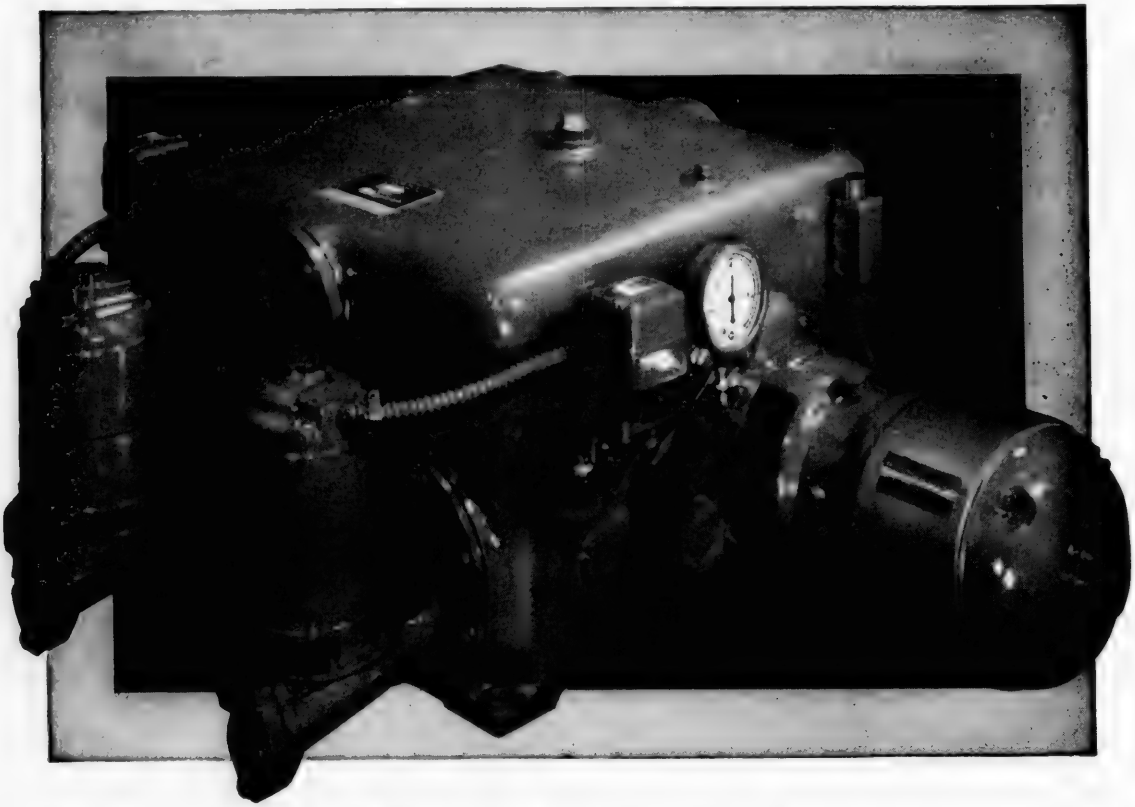
Buffalo Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

Buffalo Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY

437 WILSON, SO. NORWALK, CONN.

POWER VENTING OF GAS APPLIANCES

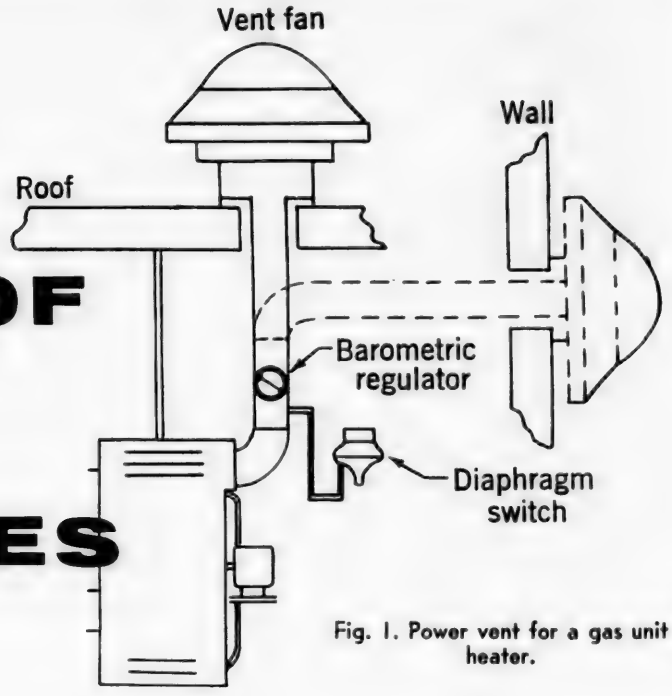


Fig. 1. Power vent for a gas unit heater.

J. PAUL JONES
Supervisor, Commercial Gas Sales,
Baltimore Gas and Electric Company, Baltimore, Md.

Power venting, or the use of mechanical energy to remove combustion products from a building, is fully discussed. Data are presented on fan selection, and the design of ducts, and also wiring diagrams for safety devices and the necessary controls.

THE widespread use of gas heating and water heating equipment, with the attendant advantages of on-the-spot location and the elimination of boiler rooms with large masonry stacks, is often handicapped by venting problems. When venting difficulties occur, they are made more serious by the fact that ineffective venting or "backdrafting" is discovered after the installation has been completed. Corrections at such a time often are difficult and expensive to make, and there is great controversy over the responsibility of the parties concerned. Power venting will solve many special venting problems.

For the purposes of this discussion, gas equipment can be divided into three categories with respect to venting requirements. These are:

1. Gas equipment designed to operate under natural draft and provided with a draft diverter (draft hood). To meet national laboratory testing requirements, the draft diverter must effectively serve two purposes; (1) to prevent chimney draft effect on combustion, and (2) safely to divert combustion products into the space where the equipment is located, together with air which is entering via the flue under backdraft conditions, without substantially effecting combustion of the gas.

2. Gas equipment designed to operate with some minimum draft. This equipment is usually basically designed for more than one fuel, gas being applied through a factory furnished conversion burner, or a conversion burner is applied in the field. Such equipment is not installed with a draft diverter which would "break" the desired draft. A barometric draft regulator is provided to control the draft exerted on the equipment.

3. Gas equipment, designed by the manufacturer, with mechanical means incorporated to exhaust combustion products by use of an induced draft arrangement or to provide for combustion under positive pressure conditions. The effect of the latter design is to have a positive pressure gradient present from the firing end to the point where products are discharged to atmosphere.

In most instances venting problems occur with the first two categories noted and are of the following origins:

1. The gas equipment is to be installed as multiple units dispersed over a wide area on one floor, and construction and use of the space above precludes running individual vents. Examples of this are when there are other floors above or when there is use of the roof for vehicle parking.

2. Adjacent buildings surround and tower above the building concerned, creating a canyon effect with highly erratic draft behavior.

3. The height of chimney required to obtain required draft (Category 2) is objectionable for architectural or other reasons.

4. The presence of exhaust fans which create a negative pressure in the space where the gas equipment is located.

Any of these problems can be solved with power vent-

J. Paul Jones joined Baltimore Gas & Electric Company in 1924 and since 1926 he has been serving as Supervisor, Commercial Gas Sales. He is a registered professional engineer in Maryland holding membership in ASHRAE and the American Gas Association. He is a member of AGA Air Conditioning and Heating Committee, Industrial and Commercial Gas Section, and the AGA subcommittee on Approved Requirements for Gas-fired Warm Air Furnaces. He served as Commander, U.S.N.R., with duty as Engineering Officer in World War II and during the Korean emergency.

ing, which is defined here as "*The use of mechanical energy to remove combustion products from a building,*" or more prosaically, the use of an electric motor-driven exhauster for this purpose.

While the use of power venting is obviously subject to approval of the local code authority concerned, its acceptability nationally is established in NFPA standard No. 54 entitled Installation of Gas Appliances and Gas Piping and in the American Standard Z 21.30—1959 of the same title. Both standards require that when such a method is used, " . . . provisions shall be made to prevent the flow of gas to the main burners in the event of failure of the exhaust system." Power venting then becomes merely a problem of a satisfactory design to accomplish the desired end.

Selection of a Suitable Fan

Now for a discussion of a power venting system design.

1. Several types of exhaust fans can be used, but the two most acceptable are probably the mushroom type wall or roof fan with enclosed motor, and the squirrel-cage scroll housing type with the impeller mounted on the motor shaft. Inlet connection only is required for the first, and both inlet and outlet connections are provided for the second. The mushroom type is installed outdoors at the point of discharge while the scroll housing type is usually installed indoors with the outlet being connected to duct work leading to the point of discharge. A weathertight scroll type fan could be installed on the roof if desired. Rooftop fans and discharge ducts must be located with sufficient clearance to avoid stoppage by snow in areas where snow occurs.

2. The fan should be selected to have the capacity to handle the products of combustion plus the dilution air normally drawn in through the draft diverter relief openings or through the barometric regulator for that equipment requiring draft. Due to low velocities, the dilution air is difficult to measure, but from mixed products analysis and experience, the following is sufficiently accurate, based on 20% excess air for combustion, 400 deg F flue gas temperature, and reasonable dilution:

$$Q = \frac{C + 1.2\ A \times D \times TC}{60}$$

Where:

Q = cfm fan capacity for standard conditions against 0.375 inch water column* external static pressure.

C = cu ft per hour gas input.

A = Air required for combustion of 1 cu ft of gas. This equals 10 cu ft of air for each 1000 Btu of heat content of 1 cu ft of gas. Also 1.2 applies when 20% air is used with other percentages of excess air.

D = Dilution factor. A value of 2 is reasonable when there is a draft hood. Otherwise use values of 1.25 to 1.5.

TC = Factor for correcting vent gas volume to the temperature condition existing at the inlet of fan. The normal factor can be taken as 1.25.

Thus, fan capacity for a gas unit heater have an input of 100,000 Btu per hr and burning gas of 1000 Btu per cu ft is:

$$Q = \frac{100 + 1.2(10)}{60} \times 2 \times 1.25 = 50 \text{ cfm}$$

3. The capacity as developed in the example is safe

* 0.375 inches water column is considered the minimum pressure to provide for adequate capacity against negative effects of exhaust fans and localized high pressure areas at point of discharge.

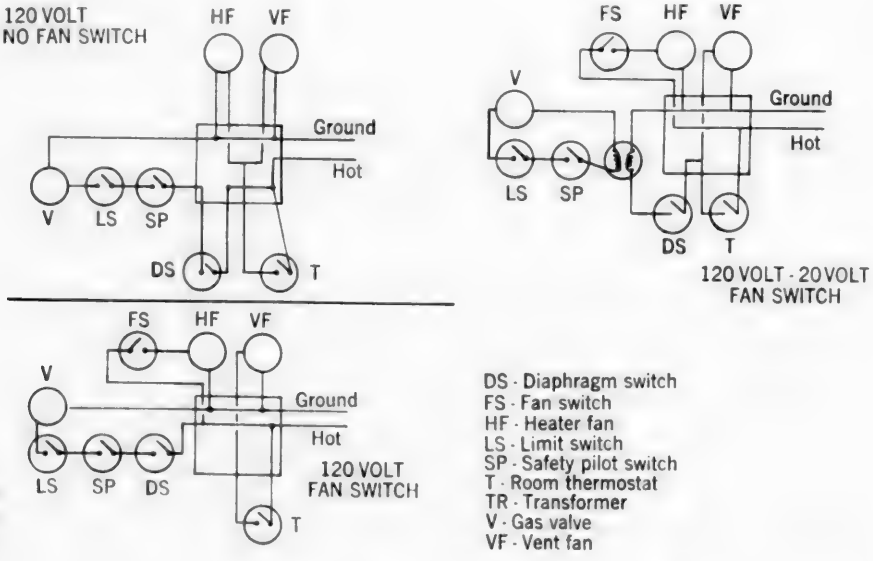


Fig. 2. Wiring diagram for the power vent of the gas unit heater shown in Fig. 1.

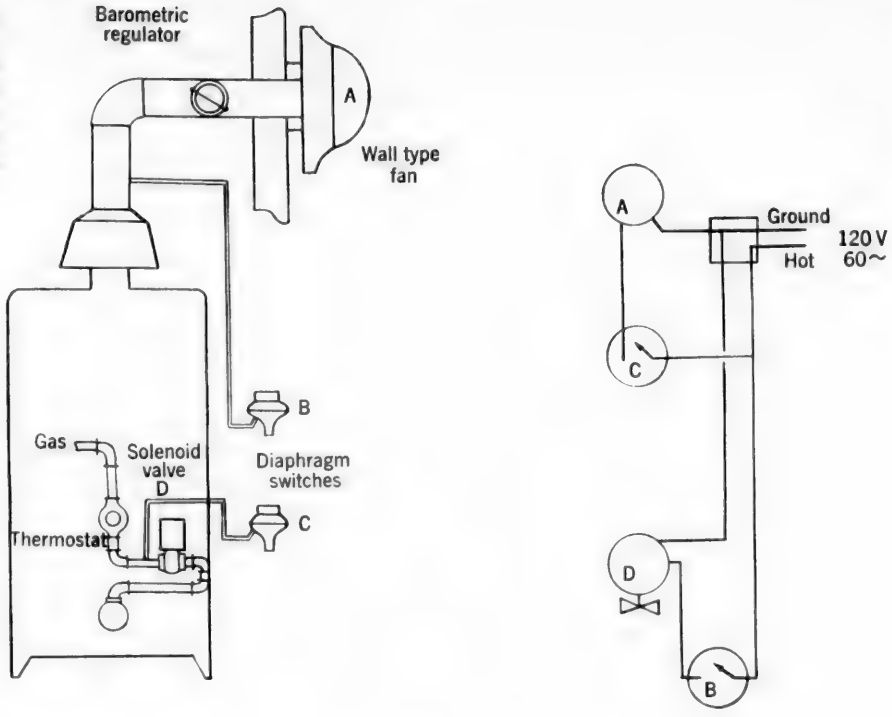


Fig. 3. Power vent, and wiring diagram, for a gas boiler with a power burner. The letters indicate, A — vent fan; B — draft sensing diaphragm switch; C — gas pressure sensing diaphragm switch; D — solenoid gas valve.

for single units vented by short ducts, not exceeding 10 ft, to individual exhaust fans. For vent runs exceeding 10 ft in length and for duct manifolds venting several heaters to one fan, it is recommended that quantities developed, as explained in the problem, be doubled as a safety factor to provide for duct leakage and because of the difficulty of balancing the duct system to provide minimum required draft at each of the several duct openings.

4. A question may arise as to the suitability of the fans described for handling hot flue gases. Experience indicates that the temperature of the diluted flue products at the fan inlet will not exceed 200 deg based on the dilution condition discussed previously. Several fan manufacturers have accepted this temperature as satisfactory for direct-connected exhausters without heat dissipating discs on the motor shaft, and experience has not shown any motor failures with the standard fans due to this cause.

Design of Ducts for Power Venting

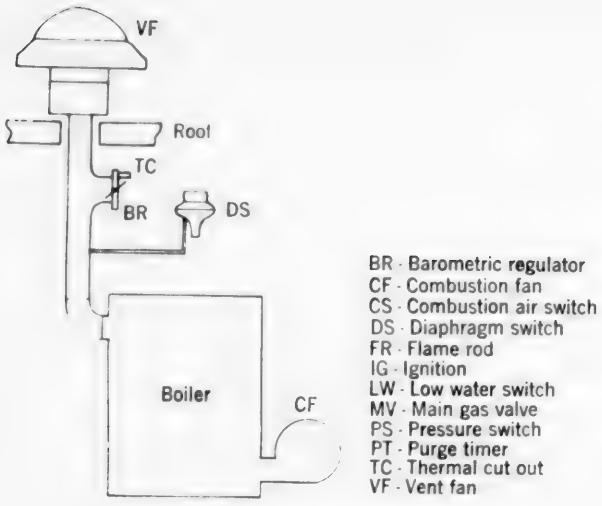
1. In designing ducts to connect the vents of one or several units of gas equipment, the standards for good design of ducts for handling heating or cooling air should be followed. Particularly, vent inlets to the duct should be at a flat angle, elbow ratios should be at least $R/W = 1.5$, (where R = radius, inches and W = width, inches), and reduction in duct size where joining the fan inlet should be of conical shape. Duct seams should be taped with asbestos tape of minimize duct leakage. Ducts for more than one heater should be designed with equal pressure loss in each section between heaters based on quantities of diluted flue products handled as derived from the formula given. The total pressure loss in the duct work should not exceed 0.1 inch water column, including entrance and discharge losses.

2. Care should be used in locating the discharge point of the exhaust fan. Diluted flue products cannot be discharged at a point where they may drift into open windows or air conditioning inlets, nor can they be discharged at levels such as sidewalks. Fan discharges, if of duct work, should terminate in weather-resistant fittings protected against birds or insects, but care must be taken not to introduce pressure losses not provided for. Horizontal discharges must be designed so as not to receive the impact of high wind velocities in a manner that will introduce high static resistance. Gooseneck discharges are not recommended.

3. Duct work for power vents is classified as a "vent connector" under the various building and fire insurance codes. The required clearance from combustible materials, as listed in NFPA No. 54, is from 6 to 9 inches depending on the equipment concerned. This clearance is reduced to from 1 to 3 inches for Type-B vent connectors. One standard Type-B vent pipe design employs a double walled metal round section with special joints, a fixed air space, and is available with several styles of fittings. Other approved materials are equally satisfactory. Most codes permit only Type-B vent piping to be used if passing through floors or through any attic or concealed space.

4. The amount of draft on each appliance connected to a power vent should be regulated to prevent excess draft on the appliance whether or not the latter is equipped with a draft diverter. In order to conserve the excess pressure capacity of the fan for use against exhaust fans in the area, or to overcome artificial high pressure areas caused by wind effect at the point of discharge, a small single acting barometric draft regulator, the nominal size being that of the vent pipe diameter, should be installed on each appliance vent* at least one foot down-

* Certain pulsation studies indicate that more desirable vent operation may be obtained with a single barometric draft regulator on the common vent, when more than one appliance is connected to the same vent (Editor's Note).



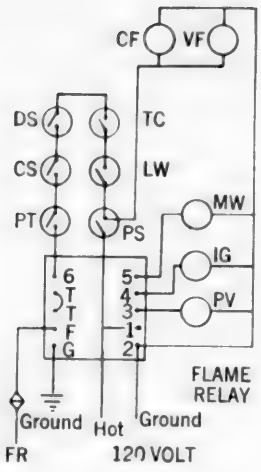


Fig. 4. Power vent, and wiring diagram, for a gas water heater.

stream from the draft diverter. For appliances requiring draft and having double acting barometric regulators for draft control, no additional means for draft regulation is required. When adjusting the completed installation, draft of draft-diverter type of appliances is adjusted by use of a match held at all points around the perimeter of the relief opening of the draft diverter while the appliance is running full. The match flame should be drawn toward the interior of the draft diverter at all points. For appliances requiring draft, draft is adjusted for proper combustion by use of a flue gas analyzer.

Safety Devices

As previously stated, power venting requires that provision be made to prevent the flow of gas to the gas burners in the event of failure of the exhaust system. For such a safety device to be effective, it must sense actual draft in the vent duct work as a condition of permitting the gas equipment to operate. Two controls used for this purpose are the adjustable diaphragm operated switch sensitive to draft as low as 0.05 inch water column, and a sail switch operated by the impact pressure of air or combustion products flowing in the system.

Normal practice is to have the primary control of the gas equipment start up only the power vent exhauster. Upon the development of the necessary negative pressure in the duct work, the safety switch closes the circuit to the basic controls of the gas appliance, permitting it to operate in a normal manner. When the primary control is satisfied, it stops the exhauster, whereupon loss of negative pressure causes the safety switch to open the circuit to the basic controls of the gas appliance shutting it off. There are many methods for connecting controls so as to have the advantage of an electrical interlock in addition to the positive draft check. In all cases, the control system must be planned so that the introduction of the power vent control does not negate the limit and safety controls of the appliance, nor does not make these limit and safety controls dependent on the power vent control for their safe function. For typical controls see Figs. 1, 2 and 3. One unit heater manufacturer furnishes a small scroll type flue exhauster with built-in sail switch, which has capacity to vent heaters with inputs up to about 300,000 Btu per hr.

For appliances such as certain automatic water heaters which have no electrical controls for normal operation, means must be provided to start the exhauster and, also, to provide the safety features mentioned. Figure 4 shows a simple method of using two diaphragm switches, one of which is actuated by gas pressure when the thermostat calls for heat and turns on the exhauster. When the exhauster develops negative pressure, the second switch opens a solenoid valve which has been connected between the standard thermostat and the main burner. When diaphragm switches are operated on gas pressure, the breather connection should be vented into the combustion chamber adjacent to the pilot, or in whatever manner local codes require.

Where several electrically controlled heaters are vented by a single exhauster, it is satisfactory to locate the draft sensing connection for the diaphragm switch at the extreme end of the duct away from the fan and connect the switch to interrupt the current supply to all of the heaters. In this case, the exhauster is run continuously, and the heaters are controlled in the usual manner by their thermostats.

Indirect Draft Inducers

There are a number of draft inducers on the market, primarily designed for assisting doubtful vent systems. These units vary in design but generally use a small fan-generated jet of air to inspirate flue products from the appliance end, and to add slight pressure to the chimney side. If these units meet the requirements of sufficient negative pressure to operate a diaphragm or sail switch, and sufficient positive pressure to overcome vent resistance and discharge resistance, they would appear to be satisfactory for use. However, the designs familiar to the author will not operate with sufficient power to overcome severe negative pressures inside the building, nor will they deliver against 0.375 inch water column static pressure. These limitations should be borne in mind when using this type of exhauster.

The cost of power venting is a charge against the gas equipment installation, and must be evaluated as part of the overall heating equipment comparison.

All Weather Comfort Standard

Recommended practices for insulating, ventilating, shading and related factors for improved comfort and economy in electrically heated and/or air conditioned homes.

Paul W. Emler, vice president, American Electric Power Service Corp., New York, N. Y., in a speech at the First National Electric House Heating Exposition, Chicago, on March 21st, introduced and described the new All Weather Comfort Standard for electrically heated and/or air conditioned homes. Here are some pertinent excerpts from his talk, followed by the Standard, itself.

IN September of 1959 a round table, attended by representatives of the insulation, glass and electric heating equipment manufacturers, NEMA, NMWA, EEI, and the utilities, was held to discuss the insulation problem. A small representative committee took on the task of developing workable insulation standards. This committee had the valuable assistance of what I will call a shirt-sleeve committee—the technical people from many of the companies represented at the insulation round table. As a result of this work, the new All Weather Comfort Standard for electrically heated and air conditioned homes which we are presenting today was born. This Standard is, I believe, completely practical and workable, and meets the shortcomings of our previous recommendations for insulating the electrically heated and air conditioned home.

Performance is the key to the new Standard—performance measured two ways. The first is over-all performance —the Btuh heat loss based on the total square foot area of the house. This is not just one loss figure for the entire country but rather various loss figures for different weather zones in the country. Values vary from 40 Btuh per square foot in an over 8000 degree day area to 28 Btuh per square foot in an under 3000 degree day area. In addition to this over-all heat loss figure, separate thermal performance values are recommended for the various structural parts of the house. If the thermal performance values recommended for the individual parts are actually attained, the total heat loss figure recommended will generally be achieved.

By using these two sets of thermal performance recommendations, the total heat loss of the house and individual thermal performance values for the various elements of the house, flexibility of design is possible which was not possible with our older recommendations. For example, if it is not practical to attain the recommended thermal performance in the house wall, it may be possible to add more than recommended insulation in the ceiling and thereby keep the total heat loss of the structure within the recommended limits. The objective is to control total heat loss and attain a satisfactory economical heating and cooling installation rather than to dictate specifically and rigidly the thermal performance of every element of the structure. On the other hand, it will be possible in many structures to keep the total heat loss below the figure suggested in the new Standard by insulating all elements of the structure so that their thermal performance will be equal to or better than values suggested in the Standard.

This new All Weather Comfort Standard has been submitted for acceptance to individual manufacturers of heating equipment, insulation, glass and air conditioning equipment, to trade associations such as National Electrical Manufacturers Association, National Association of Home Builders, National Mineral Wool Association, Air Conditioning and Refrigeration Institute, National Warm Air Heating and Air Conditioning Association and Edison Electric Institute, as well as a number of individual electric utilities. Many acceptances have already been received and the Standard is being considered by other individual companies and associations who have not yet made decisions.

At the present time there is no one official sponsor for the Standard but it is our plan to have it sponsored by a group which will officially represent the companies and associations having a direct interest in insulating the electrically heated and air conditioned home.

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ALL WEATHER COMFORT STANDARD

Purpose

To encourage good insulation practice so the owner will benefit from:

1. Lower first cost of both heating and cooling equipment.
2. Lower operating cost for both heating and cooling.
3. Greater comfort for the occupants during both the heating and cooling seasons.

Objectives

To establish:

1. Recommended thermal performance values for electrically heated homes.
2. Recommend maximum summer heat gain for air-conditioned homes.
3. Responsibility for insulation quality and application.

RECOMMENDED THERMAL PERFORMANCE VALUES FOR ELECTRICALLY HEATED HOMES

When based on an infiltration rate of one air change per hour, the heat loss values in Table I, which are expressed in Btuh per sq ft of floor area of the space to be heated to the comfort level, measured to the outside of exterior wall, will generally be achieved with the thermal performance values recommended in Table II.

TABLE I—RECOMMENDED HEAT LOSS VALUES

Degree Days	Btuh per sq ft	Watts per sq ft
Over 8000	40	11.7
7001 to 8000	38	11.3
6001 to 7000	35	10.3
5001 to 6000	32	9.4
3001 to 5000	30	8.8
Under 3001	28	8.2

TABLE II—THERMAL PERFORMANCE VALUES FOR VARIOUS BUILDING SECTIONS

Building Section	U Value* Btu per (hr) (sq ft) (F)
Ceiling	0.05
Frame Walls	0.07
Masonry Walls	0.12
Floor over vented spaces	0.07
Floors over unheated basements	0.09
Slab edge heat loss	30 Btuh per linear foot

* Calculated in accordance with the method described in current ASHRAE Guide, before correction for framing.

These values may need improvement in severe climates, when ceiling heat is used or when glass areas constitute a larger percentage of gross wall area than provided for in the establishment of the values.

Weatherstripping, double glazing and storm doors should be used as required to meet the values in Table I and for comfort and operating economy.

It is recommended that infiltration, natural and mechanical ventilation, vapor barrier and slab on grade heat loss considerations be guided by the excerpts contained in the Appendix.

It is recommended that sections between regularly and periodically heated spaces be insulated when the temperature difference between them is expected to be more than 20 deg F.

It is recommended that fireplaces be provided with tight fitting dampers.

RECOMMENDED MAXIMUM SUMMER HEAT GAIN FOR AIR CONDITIONED HOMES

It is recommended that the total calculated heat gain to all space to be cooled to the comfort level not exceed 25 Btuh per sq ft of floor area of this space, measured to the outside of exterior walls, when calculated from the data contained in the current ASHRAE Guide.

It is recommended that consideration be given to shading glass areas by natural or mechanical means in order to minimize sun effect.

The recommended maximum heat gain value can generally be achieved with the performance values recommended in Table II when consideration is given to shading of glass areas.

RESPONSIBILITY FOR INSULATION QUALITY AND APPLICATION

The insulation manufacturer shall be responsible for the quality of material and when required shall certify to its performance when installed in accordance with his application standards.

The insulation applicator shall be responsible for installing the material in accordance with the manufacturer's recommendations and shall so certify when required to do so.

APPENDIX

INFILTRATION HEAT LOSS

Quoted from FHA Technical Circular No. 7, Revised August, 1959, "Heat Loss Calculations".

One air change per hour may be assumed a reasonable average for estimating the infiltration heat loss. Infiltration values calculated on the basis of the "crack method" are considered acceptable, provided the result is not less than the equivalent of ½ air change per hour.

VENTILATION OF STRUCTURAL SPACES

Objective

To provide natural ventilation of spaces such as attics and basementless spaces to minimize the effect of conditions conducive to decay and deterioration of the structure and to reduce attic heat in the Summer.

General

Net free area of an opening is the total unobstructed area through which air can pass.

Basementless Spaces (Crawl Spaces)

At least 4 foundation wall ventilators shall be provided, one located close to each corner of the space, having an aggregate net free ventilating area not less than 1/150 of the area of the basementless spaces; or

Ground surface treatment shall be provided in the form of a vapor barrier material plus at least 2 foundation wall ventilators having an aggregate net free ventilating area not less than 1/150 the area of the basementless space.

Attics and Spaces Between Roofs and Top Floor Ceilings

Provide cross ventilation for each separate space by ventilating openings protected against the entrance of rain and snow.

Ratio of total net free ventilating area to area of ceiling shall be not less than 1/150, except that ratio may be 1/300 provided:

a. A vapor barrier having a transmission rate not exceeding one perm is installed on the warm side of the ceiling; or

b. At least 50% of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated (at least 3′–0″ above eave or cornice vents) with the balance of the required ventilation provided by eave or cornice vents.

MECHANICAL VENTILATION

Objective

To provide mechanical ventilation for bathrooms and kitchens not ventilated by natural means.

Bathrooms

Fan shall have sufficient capacity to provide a minimum of twelve air changes per hour.

TABLE 10-1—SLAB EDGE HEAT LOSS FACTORS

Outdoor design temperature (Deg F)	Total width of insulation (inches)	Heat Loss Coefficient, F (Btuh per linear foot of exposed slab edge)					
		Unheated Slab			Heated Slab		
		R = 5.0	R = 3.33	R = 2.50	R = 5.0	R = 3.33	R = 2.50
—30 and colder	24	34	51	67	46	69	92
—25 to —29	24	32	48	64	44	66	88
—20 to —24	24	30	45	60	41	61	82
—15 to —19	24	28	43	57	39	59	78
—10 to —14	24	27	40	54	37	55	74
— 5 to — 9	24	25	38	51	35	52	70
0 to — 4	24	24	36	48	32	48	64
+ 5 to + 1	24	22	33	44	30	45	60
+10 to + 6	18	21	31	42	25	38	50
+15 to +11	12	21	31	42	25	38	50
+20 to +16	edge only	21	31	42	25	38	50

Notes:
R = Thermal Resistance of Insulation.
Use F = 40 for unheated slabs or F = 75 for heated slabs, if perimeter insulation is not used.
Table from F.H.A. Circular No. 300, Minimum Property Standards for 1 and 2 Living Units.

Kitchens

Fan shall have sufficient capacity to provide a minimum of 15 air changes per hour in area occupied by kitchen.

VAPOR BARRIERS

Walls

A vapor barrier shall be installed on the warm side of the walls when the U value of the wall is numerically less than 0.25.

Ceilings

Install on warm side of ceiling when a vapor barrier is provided.

Roof Deck

When roof deck material is also the finished ceiling, a vapor barrier having a vapor permeance of not more than ½ perm shall be installed near the warm side of the construction in areas having a design temperature of 10 deg F or lower.

Concrete Slabs and Basementless Spaces

Maximum vapor permeance shall not exceed ½ perm for vapor barrier under concrete slabs and 1 perm for ground cover in crawl spaces.

SLAB ON GRADE HEAT LOSS

Calculations of heat loss through concrete slab floors shall be made using the following formula:

$H = F \times P$ where:

H = heat loss of the floor, Btuh

F = heat loss coefficient, Btuh per linear foot of exposed edge, from Table 10-1.

P = perimeter or exposed edge of the floor, linear feet.

Here's what NMWA did with the All Weather Comfort Standard

NATIONAL Mineral Wool Association member companies first decided to accept the All Weather Comfort Standard. Then they unanimously voted to recommend "installed resistance" designations as a means of showing which specific mineral wool products are suitable for ceiling, wall or floor application.

According to F. H. Sides, NMWA executive officer, the definition of "installed resistance, R" is the resistance of the mass insulation itself, plus the resistance values of the air spaces and surfaces that come into existence when the insulation is installed. He added that NMWA is recommending to its members that in the future they mark all mineral wool batts and blankets with appropriate "R" numbers. When a particular product is suitable for use in different structural sections of a house, considering the different directions of heat flow involved, the labeling will include "R" factors for each application.

How is "R" determined? Merely by taking the reciprocal of the recommended "U" value for any structural section to convert it into total units of resistance. From this, you subtract the inherent thermal resistance values of the building materials used in that structural section (siding, sheathing, wallboard or plaster, etc.), plus the value of the room-side surface resistance. The balance is the installed resistance requirement of the insulation, denoting the "R" labeling of the product that should be used.

For typical ceiling, wall and floor sections, Table A shows the "R" values which conform to the "U" values of the All Weather Comfort Standard for electrically heated and/or air conditioned homes. In addition, it presents NMWA-recommended "U" and "R" values for gas or oil heating and for minimum acceptable comfort.

TABLE A—RECOMMENDED INSTALLED RESISTANCE (R) VALUES OF INSULATION

Building Section	Electric Heating and/or Air Conditioning		Gas or Oil Heating (No Air Conditioning)		Minimum Acceptable Comfort	
	U	R	U	R	U	R
Ceilings	.05	19	.07	13	.10	9
Frame Walls	.07	11	.09	8	.11	7
Floor over vented Crawl spaces ..	.07	13	.09	9	.11	7

Example: Insulation applied to typical wall construction for an electrically-heated home should be labeled R-11. This fulfills total resistance requirement for U value of .07 Btu per (hr)(sq ft)(F).

A Russian engineer writes on

Single-Pipe Hot Water Heating

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Part 1 – Classification, Pipe Sizing, and Control

One-pipe hot water heating is the most prevalent of all current heating systems in the Soviet Union for buildings four stories and over. To speed the design of such systems, the Russians have designed a special slide rule which is reproduced and explained in next month's installment.

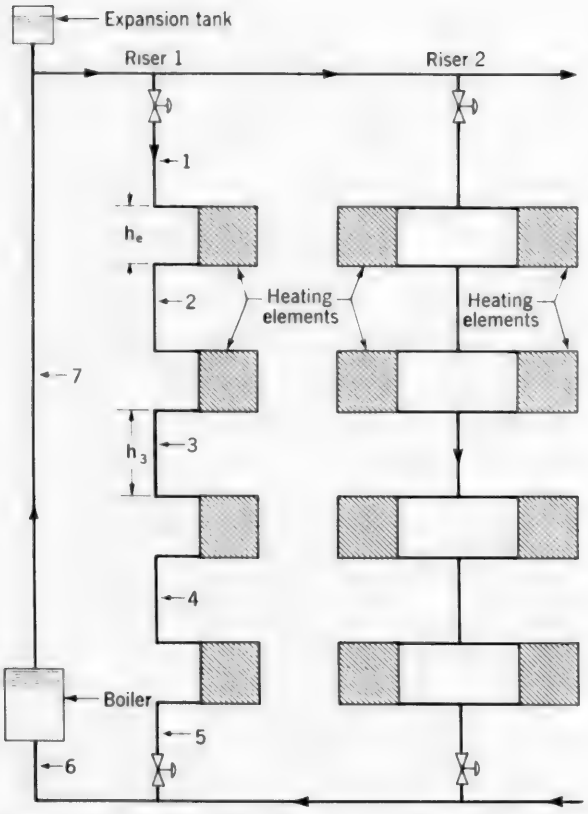

Fig. 1. A series-flow, non-adjustable, single-pipe hot water heating system. Piping sections are numbered for identification in pipe-sizing formulas in the article. Only one heating unit is attached to Riser 1 on each floor. Riser 2 has two attached units on each floor.

THE single-pipe hot water heating system is the most used heating system in the Soviet Union. Its popularity is due to its high performance, sanitary, and hygienic characteristics. In most cases, these systems are employed in buildings four stories and over, since their use becomes increasingly economical the taller the building provided that the heating elements are connected to vertical risers.

However, in buildings over 200 ft high, several individual systems are located one above the other, to prevent hydrostatic pressure in the lower portion of the system exceeding the pressure the heating units can take. When stacked, each system is provided with its own expansion tank located in the upper part of the building serviced by the given system. Thus, each system has its own hydrostatic pressure determined by the elevation of its expansion tank.

Classification of Systems

Single-pipe systems may be divided into the more frequently used type with elements connected to vertical risers, and the rarely-used systems where elements are connected to horizontal pipes with flow lines on each floor.

Each category may be divided, in turn, into through-flow (series) systems, where all water supplied to the riser or horizontal line passes in succession through all the elements connected to the given riser or horizontal line, and into systems where part of the water is bypassed around the heating element.

Figure 1 is a schematic diagram of a non-adjustable series system. It is the cheapest to build and has the fortunate characteristic that it readily compensates for thermal expansion and contraction in the risers. Its chief

Iosiff F. Livtchak is a corresponding member of the Academy of Building and Architecture of the USSR, Moscow, and deputy director and research manager of the Academy's Institute of Installations. One of the leading Russian specialists in heating and ventilating of residential and public buildings, he also holds the title of professor of heating and ventilating. Dr. Livtchak graduated from the Moscow Building Institute in 1938, received a masters degree in 1946, and his doctorate in 1952.

This is the second article by Dr. Livtchak to be published in Air Conditioning, Heating and Ventilating. The first, District Heating in the USSR, was published in three parts, commencing in the June, 1958 issue of the magazine.

The author is a recent visitor to this country, having participated, with a group of Russian architects and engineers, in a two-week tour of the United States this winter. While in New York, Dr. Livtchak and an assistant conversed with members of the industry and collected data on American practice in heating and air conditioning.

drawback is the impossibility of regulating the output of the individual heating elements, since a change in the quantity of water supplied to one element leads to a change in circulation through the entire riser. This drawback limits the system's field of application to a considerable degree.

Sizing the System

Calculations for piping and element sizing are quite simple. After establishing the thermal loading of the diagram, the quantity of water circulating in each riser, g, is determined by the formula:

$$g = \frac{\Sigma Q}{C\,(t_s - t_r)} \qquad (1)$$

where ΣQ = the quantity of heat emitted by all elements on the given riser,
t_s = the design temperature of the supply water,
t_r = the design temperature of the return water, and
C = the specific heat of water.

Having found the quantity of water passing through the riser, the temperature of the water supplied to each heating element is determined by the formula:

$$t_{in} = t_s - \frac{\Sigma Q_{above}}{g\,C} \qquad (2)$$

where t_{in} = the temperature of the water entering one element of the riser, and
ΣQ_{above} = the quantity of heat put out by all heating elements located above the one for which t_{in} is being determined.

Note that the temperature of the water entering the heating element is the same as the leaving temperature of the element above, provided cooling of the water in the riser is disregarded.

Knowing the temperature of the supply and return water for each heating element, heating surface is calculated in the same way as in two-pipe systems, except that, as a greater quantity of water passes through each element, the heat transfer coefficient is somewhat higher due to the increased velocity of water in the element's passages. Thus, total heating surface of the systems under examination is somewhat smaller than in two-pipe hot water systems.

Gravity Circulation Pressure

Gravity circulation head, H_{nat}, in the circuit which includes a given riser, is defined by the formula:

$$H_{nat} = \Sigma\, hw_{down} - \Sigma\, hw_{up} \qquad (3)$$

where hw_{down} = the sum of the products of vertical length of each circuit section, through which the water moves downward, and the corresponding density of the water, while

hw_{up} = the sum of the products, etc, as above, for sections where the water is rising.

Thus, gravity head in Riser 1, Fig. 1, will be:

$$H_{nat} = [h_1 w_s + h_e(w_s + w_2)/2 + h_2 w_2 + h_e(w_2 + w_3)/2 + h_3 w_3 + h_e(w_3 + w_4)/2 + h_4 w_4 + h_e(w_4 + w_r)/2 + h_5 w_r] - [h_6 w_r + h_b(w_r + w_s)/2 + h_7 w_s]. \qquad (4)$$

where h represents a vertical distance, w represents density, the numbered subscripts represents the sections of piping in Fig. 1, the subscript e represents the distance between riser sections, subscript b, the boiler, and the subscripts s and r, supply and return.

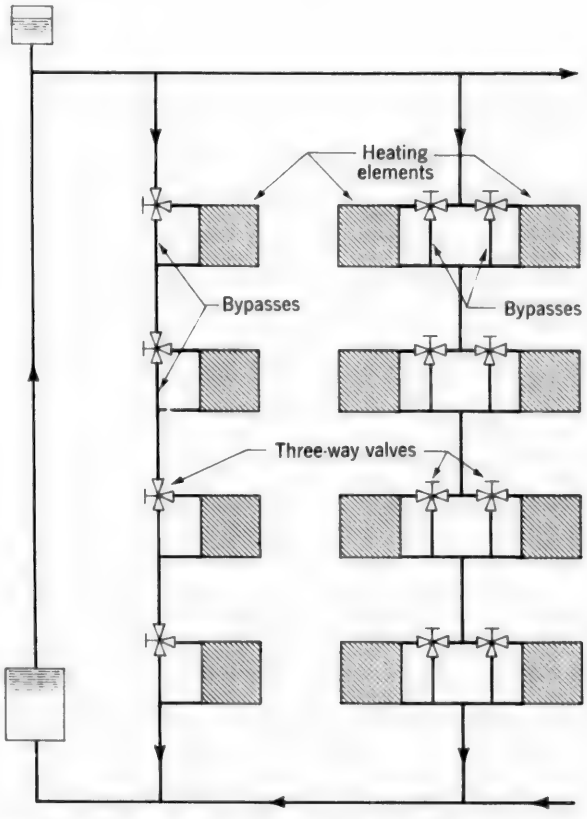

Fig. 2. A series-flow, vertical, adjustable system with three-way valves controlling the amount of water bypassed around the heating elements.

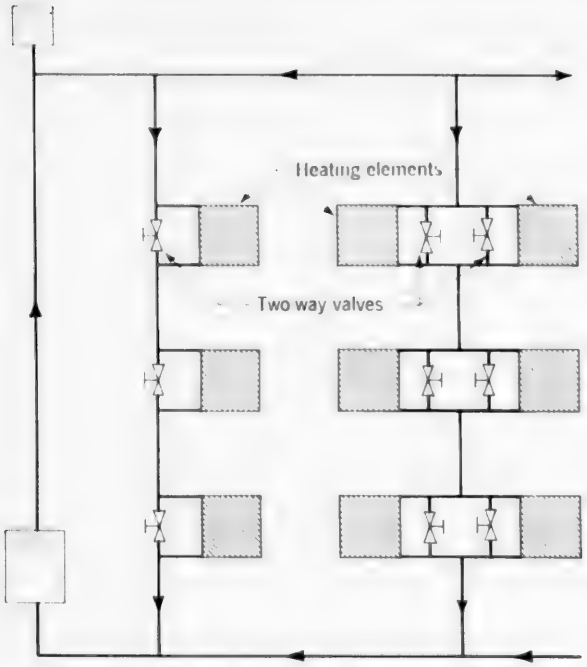

Fig. 3. A series-flow adjustable single-pipe hot water heating system with two-way valves controlling flow through the bypasses.

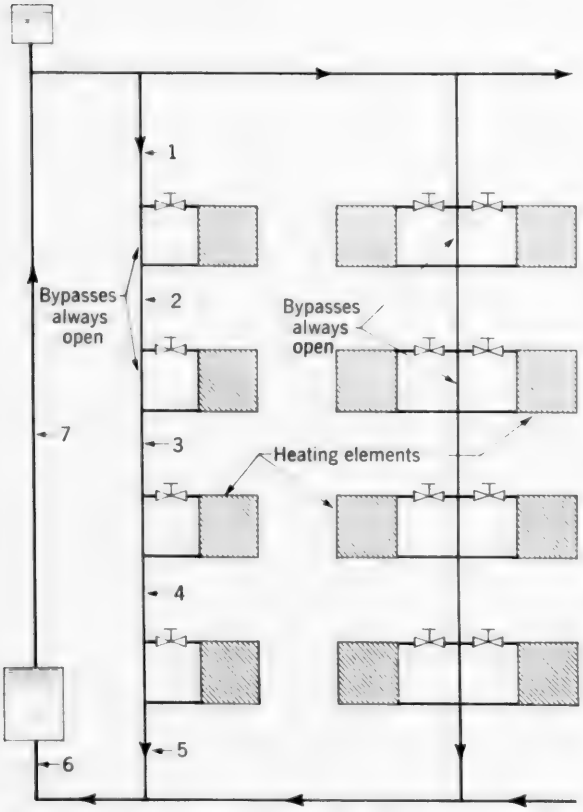

Fig. 4. A series-flow, vertical hot water heating system with bypasses that cannot be closed. Two-way valves control the flow of water to each heating element. Piping sections are numbered for identification in pipe-sizing formulas in the article.

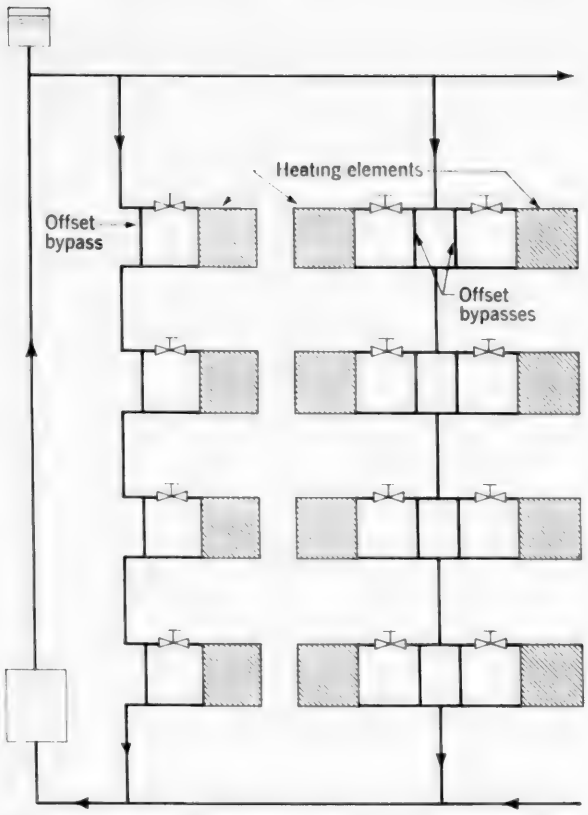

Fig. 5. A series-flow system with bypasses offset to assure a steady flow of water into each heating element.

Where the heating system incorporates a booster pump for forced circulation, total circulation head is the sum of pump and gravity heads:

$$H = H_{pump} + H_{nat} \qquad (5)$$

where H = total circulation head, and
H_{pump} = pump head

Temperature drop of the water in the piping is disregarded in these hydraulic calculations. When greater accuracy is demanded, special tables are available to determine the extra circulation pressure due to temperature drop in the piping.

Knowing the circulation pressure in the circuit, and the quantity of water that passes through its sections, pipe diameters are chosen in the usual way, proceeding from the criterion that total available head should exceed frictional and local resistances by 5% to 15%.

System with Bypasses

Figure 2 is a schematic of a through-flow adjustable vertical system with three-way valves. This system has bypasses which are closed by the three-way valves when the heating elements are working at design conditions. Thus, the operation and calculation for the system is identical to that just described. At any time the flow of water in the heating element may be decreased or cut off altogether by the three-way valve. In Fig. 3 a through-

flow adjustable vertical system, with two-way valves in the bypasses, operates with valves normally closed, thus in the same manner as already described. To decrease heat emission from any unit, the by-pass valve is opened, decreasing the quantity of water passing through the heating element. In this arrangement, there is no possibility of cutting a heating unit completely off.

In Fig. 4 is shown the form of one-pipe system most widely used in the Soviet Union. It has bypass sections that cannot be closed off. Under design conditions, a fixed quantity of water flows in the bypasses. All other things being equal, the result is that the heating surfaces must be sized somewhat larger. The bypass piping is made one size smaller than that of the riser. In addition, the bypasses are sometimes offset from the riser axis, as shown in Fig. 5. Although these measures complicate the erection of the system, they provide resistance in the bypasses and thus assure the flow of water into the heating elements.

Design of a single-pipe system with non-closing bypasses begins with a determination of water quantity through the riser and defining its temperature throughout the riser, using formulas (1) and (2). Then gravity head in the riser circuit is found with the aid of formula (3).

The fact, however, that water temperature in the bypass is equal to that in the riser section above it, simplifies the form of formula (3) for this application. Gravity head now is:

$$H_{nat} = [h_1w_s + h_2w_2 + h_3w_3 + h_4w_4 + h_5w_r] - [h_6w_r + h_b(w_r + w_s)/2 + h_7w_s] \quad (6)$$

where, again, cooling of water in the piping is neglected for the purpose of hydraulic calculation. (Letter symbols define the same quantities as in equation (4).)

Pipe sizing is, at this juncture, impossible because the relative quantity of water passing through the heating elements and the bypasses is unknown. Solution of this problem involves making successive approximations.

A first approximation may be had from a plot of empirical values, such as that shown in Fig. 6, where the three dimensions on each curve refer, respectively, to the diameters of the riser, bypass section, and element connecting piping. The quantity on the x-axis is velocity and the readout on the ordinate is the coefficient a, the ratio of quantity of water flowing through the heating element and the riser ($a = g_e : g$).

Given the coefficient a, one can determine flow through the heating element and bypass as follows:

$$g_e = g \cdot a \quad (7)$$

$$g_b = g - 2g_e \quad (8)$$

where g_e = flow through the heating element, and
where g_b = flow through the bypass.

As before, pipe sizing is based on a total of frictional and local resistance of 5% to 15% less than total available head. It should then be ascertained that frictional and local losses in the supply lines to the unit, and in the unit proper, do not exceed the available local head, which is determined by the formula:

$$H_n = (p + q)_b + h_e(w_e - w_b) \quad (9)$$

where $(p + q)_b$ = losses and local resistances in the bypass,
h_e = the height of the heating element, and
w_e and w_b = density of water in the heating element and bypass, respectively.

To determine the density of the water in the unit, we first determine its leaving water temperature, T_{out}, from the formula:

$$T_{out} = T_{in} - \frac{Q_e}{G_{in} \cdot C}$$

where T_{in} = temperature of the water flowing into the element, or the temperature of the water in the bypass, which is the same thing,
G_{in} = quantity of water flowing into the unit,
Q_e = heat output of the unit, and
C = specific heat of water.

Having determined the available head in the supply lines, a calculation is made, using the diameters and flow quantities passing through the heating element, of the frictional and local losses in the supply lines and heating unit. These losses should not exceed the available head, otherwise it will be necessary to make a new calculation, sizing the bypass larger and cutting down the flow in the heating element.

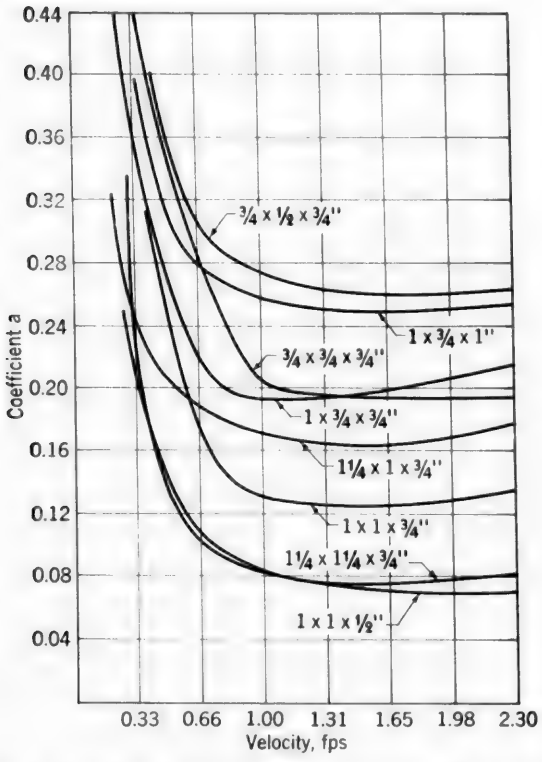

Fig. 6. Chart for determining the proportion of riser flow that passes through the heating element at various flow velocities. First figure on each curve represents the riser diameter; the second, the diameter of the bypass; and the third, diameter of connecting piping to the element.

In Part 2, next month, the author introduces a special slide rule and shows how it is used for rapid pipe sizing without resort to tables or graphs.

A Solution to the Problem of

Subsurface Drainage

When Tide and Ground Waters Coexist

Rising groundwater levels following a storm might have cracked the boiler pit floor slab had not provision been made for adequate subsurface drainage. Drainage design was based on an educated guess, in the absence of reliable data, after it was discovered that actual water levels were over two feet above elevations used to design the boiler pit slab.

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ONE OF THE MOST IMPORTANT FACTS of which an architect must be certain is the elevation, if any, of subsurface water at the building site. It will have an important bearing on the establishment of basement or cellar levels and, hence, on the height of the building above grade.

Subsurface water may be at tidewater level, which then varies in elevation, depending upon how far it is located from a tidal stream, becoming practically constant if distant from the stream. On the other hand, subsurface water may be a permanent ground water level, determined by hydrostatic factors existant in the general area of the site.

When Tide and Ground Waters Coexist

This article discusses the least often encountered situation in which both tide and ground waters coexist for short periods and then settle down to a constant tidewater level. Such a condition will occur at a site close to a tidal stream where rock or other impervious ground contours direct storm waters to the site in question, causing tidewater level to be raised some hours after the storm has begun and reduced some hours or days after the storm has ended.

This situation was met with in the development of the plans for a large school building some time ago. The architect was under great pressure to produce the plans for early construction when it was discovered, in the course of a preliminary excavation contract, that water levels encountered were 2 ft 6 inches above the levels by which the foundation designers had proceeded with their design of the boiler pit, basement floor slab, and column footings.

Conveyance of this fact caused great anguish, for there would have been a serious delay in the completion of plans if extensive changes were required in the foundation plans, a delay that would have jeopardized the chances of meeting the deadline for inclusion in public budgetary appropriations.

The discrepancy between actual and estimated water levels occurred because original borings were made in an extended dry season when the presence or lack of contributing ground water could not have been discovered by soil borings.

Subsurface Drains Protect the Foundations

The remedy suggested was that 6-inch dia subsurface tile drains, to circumscribe the boiler pit and basement of the structure, be included in the foundation plans. As shown in Fig. 1, from these piping circuits would be extended an 8-inch vitrified tile drain line to a pumping station to be located in the yard at the rear of the building, and from which the subsurface waters would be discharged to the public sewer in the adjacent street.

Acceptance of the general solution by those responsible for prompt completion of all plans and specifications for the building was followed by a search for reliable data that could serve as criteria for design of the pumping station, including size and depth of the receiving basin, the rate of discharge into this basin, and the required pump capacity.

Because no such data were available, it was necessary to proceed on the surmise that the rise in subsurface

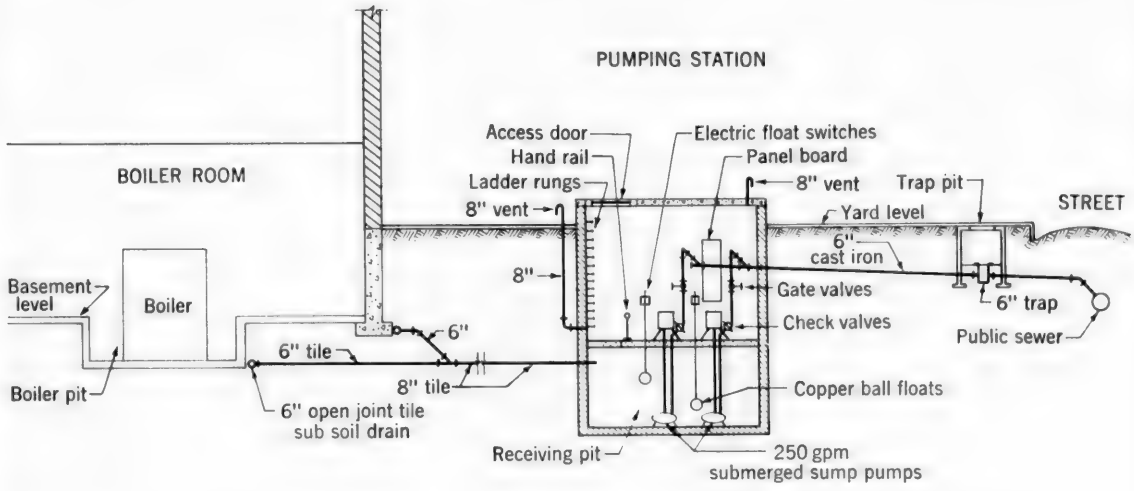

Fig. 1. Diagram of sub-surface drainage system for building with basement and boiler room below periodic tidewater and surfacewater high levels.

storm water level after a sizable rainfall would not exceed a rate of one inch per hour in the general area of the building in question.

Calculations for Sizing

On this basis, volume and gallonage of water that would have to be removed from under the basement and boiler pit floors was arrived at. This removal had to be rapid enough to prevent the build-up of hydrostatic head and consequent cracking of boiler pit slab and flooding of boiler pit.

Pump capacity was determined as follows: The area of the low portion of the basement (refer to Fig. 1) was 205 ft by 93 ft = 19,000 sq ft. With an assumed rate of rise of ground water of one inch per hour, the volume increase is 19,000 sq ft $\times 1/12$ ft $\times$ 7.5 gal per cu ft = 11,875 gph. Dividing by 60, this amounts to 198 gpm. Thus, two 250-gpm pumps were specified, to operate singly, and simultaneously when required.

Design of the pumping station was more or less routine after determination of pump size. The pumps discharge through a 6-inch independent house sewer to the public sewer through valves, checks, and running trap. What made this design and its successful achievement particularly satisfying was the pure happenstance which afforded a positive proof that the installation was justified under the circumstances.

Accident Proves Design

During completion of the pumping station, the electricians, working in the pumping station, plugged the 8-inch line entering the receiving pit, for reasons unknown, and inadvertently left the job at quitting time on Saturday noon without removing the plug. The writer received a telephone call advising him of this situation, whereupon he called the plumbing contractor and advised him to proceed at once to the site and to remove the plug.

Arriving at the site before the contractor, the writer noticed that a number of streams were spouting, 2 ft high, from the corner intersections of the boiler pit floor and walls, and also that there was considerable wetness at the corner intersections of the basement floor and walls.

Here was visible proof that a hydrostatic head had developed as a result of the crippling of the subsurface drainage system.

Years later, the basic criteria of one inch per hour rise of ground water level following storms was borne out by custodial reports to the effect that, after heavy storms, the 8-inch line entering the receiving chamber of the pumping plant ran one-half full for approximately one and one-half days, gradually tapering off to a trickle.

Conclusions

All this would lead to the conclusion that where any uncertainty develops regarding the level of underground water which may result from a combination of both tidal and surface water infiltration, test holes or sounding pipes, located in or near a proposed site, should prove invaluable for obtaining reliable data concerning the maximum high water level, or the rate of rise in water level, following severe storms.

The practical approach, in most cases, will be to design with respect to maximum high water levels, but it is not entirely inconceivable that there may arise situations where the economies of a project will suggest a design which takes due notice of the permanent tidewater level and disposes of any periodic excess water level, due to infiltration, by automatic pumping.

This is the eighth and final article in a series dealing with refrigerant piping hookups. Various component parts of a refrigerant piping system were considered in these articles, and both proper and poorly designed hookups shown. This article is on cooler design, oil return and control valves.

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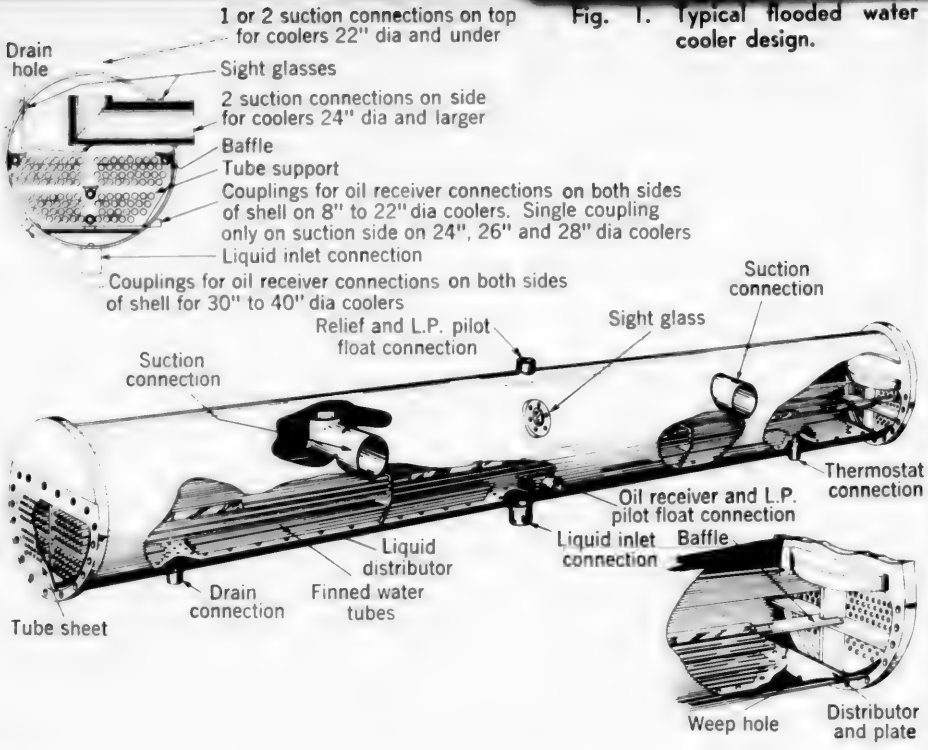

1 or 2 suction connections on top for coolers 22" dia and under
Drain hole
Sight glasses
2 suction connections on side for coolers 24" dia and larger
Baffle
Tube support
Couplings for oil receiver connections on both sides of shell on 8" to 22" dia coolers. Single coupling only on suction side on 24", 26" and 28" dia coolers
Liquid inlet connection
Couplings for oil receiver connections on both sides of shell for 30" to 40" dia coolers
Suction connection
Sight glass
Relief and L.P. pilot float connection
Suction connection
Thermostat connection
Oil receiver and L.P. pilot float connection
Liquid inlet connection
Baffle
Liquid distributor
Drain connection
Finned water tubes
Tube sheet
Weep hole
Distributor and plate

Fig. 1. Typical flooded water cooler design.

Refrigerant Piping for Flooded Water Coolers

FLOODED water coolers are widely used for chilling water which is supplied to air cooling and dehumidifying coils, as well as for brine cooling service on low temperature refrigeration systems. The broadest range of usage is for duties of 50 tons and upward with nearly all centrifugal compressor cooling systems furnished with the flooded type cooler.

The term "flooded" is used because the tubes within the shell, with water flowing through them to be cooled, are submerged in a bath of liquid refrigerant. As the liquid refrigerant absorbs heat from the warmer water, it evaporates and the vapor flows to the compressor suction. Removable water heads are provided at each end of the cooler to facilitate cleaning the water side heat transfer surface. The refrigerant side heat transfer surface is not accessible since corrosion or scaling will not occur in a properly installed and dehydrated system.

Cooler Design

Figure 1 shows a cutaway view of a good design flooded water cooler. Water from the air handling units flows in one end of the tube bundle and by any number of pass arrangements from one to four, the optimum water velocity can be obtained to provide efficient heat transfer and long cooler life. Water velocities of 8 ft per second or less are preferred to minimize corrosion and erosion hazards, although velocities as high as 10 ft per second are acceptable on closed water systems with clean water and a pH value of about 7.0. The tubes generally contain fins with a spacing of about 18 to 20 fins per inch to increase the ratio of outside tube surface to inside surface area. The outside to inside surface ratio is about 3.5 to 1 which provides a good balance between the film coefficients of the water, which is quite high, and the refrigerant, which is somewhat lower.

Liquid refrigerant from the high pressure side of the system passes through an expansion device where flash gas is formed, resulting in a mixture of refrigerant liquid and vapor entering the bottom of the water cooler. This high velocity fluid stream contains kinetic energy which must be dissipated as it enters the cooler. Otherwise, there would be a jet or gusher effect at the entrance which could result in liquid droplets entering the gas stream flowing to the compressor. A distributor plate is provided between the entrance at the bottom of the cooler and the tubes to break up the entering jet of refrigerant and to permit equal distribution of the flash gas throughout the length of the cooler.

The heat transfer film coefficient between the tube and refrigerant is a function of both the temperature difference and the refrigerant movement over the surface. The temperature difference will be a function of the loading per square foot of surface, but the velociy of the refrigerant over the tube surface will be influenced by the flash gas flowing to the surface to be liberated from the liquid. Therefore, even distribution of the flash gas throughout the length of the cooler will promote better overall heat transfer. The distributor is generally a perforated metal plate with the holes properly sized and located to provide the best performance for the refrigerant to be used and for its respective duty.

A large surge space is provided above the tube bundle

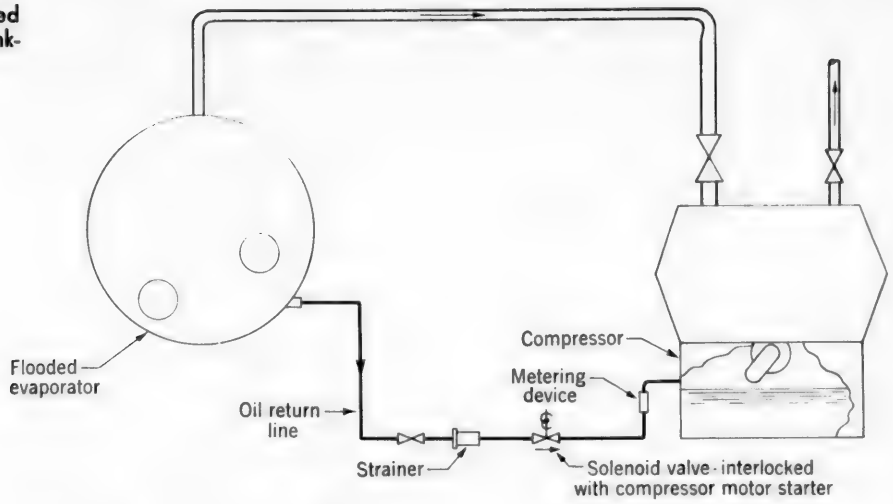


Fig. 2. Oil return from flooded evaporator to compressor crankcase.

to permit low gas velocities which will allow separation of the liquid from the vapor. This permits a dry refrigerant vapor, free from liquid droplets, to flow to the compressor. Note in Fig. 1 that two gas connections are located on the cooler. The purpose here is to permit lower horizontal gas velocities for effective liquid separation. Two suction connections results in 4-way gas flow above the tube bundle, whereas a single connection would result in 2-way gas flow at twice the horizontal gas velocity.

Sight glasses are very desirable on the flooded type cooler to permit visual inspections of the refrigerant liquid level during operation. This is important in that it permits the serviceman to properly charge the system and/or to obtain the optimum liquid level setting for the low side refrigerant control, where used.

The standard working pressure for the water side of the cooler is usually 150 psi which is suitable for most installations. When exceptionally high multi-story buildings result in excessive static pressures, the location of the water cooler on the lower level may require that the heat exchanger be provided with a higher design working pressure. The refrigerant side design working pressures normally used are 150 psi for Refrigerant 12 and 225 psi for Refrigerant 22. These working pressures will permit the idle cooler to warm up to ambient temperatures above 100 deg F without danger of loss of refrigerant through the relief device.

Oil Return

The very design of the flooded water cooler, with the surge space above the heat transfer surface, discourages oil return to the suction line due to the low gas velocity. Consequently, other means are incorporated to return the oil reaching the evaporator, back to the compressor where it is needed for lubrication. The concentration of oil in the evaporator is not critical except for the effect it may have in retaining oil needed by the compressor. Concentrations as high as 10% by weight of oil mixed with the refrigerant have resulted in an almost negligible heat transfer penalty. Concentrations much in excess of this will penalize the heat transfer performance. A relative figure procured from test information indicated that 45% oil by volume doubled the normal temperature split between the refrigerant and leaving water.

Oil concentrations of between 1 and 5% are most common in the evaporator of flooded systems with reciprocating compressors. A fairly high concentration of oil is preferred from the standpoint that the refrigerant charge can be greatly reduced. The addition of a fairly high concentration of oil with the refrigerant liquid increases the foaminess of the mixture so that all of the heat transfer surface can be properly wetted with a minimum refrigerant charge.

One method of returning oil from the evaporator to the compressors is illustrated in Fig. 2. By providing a

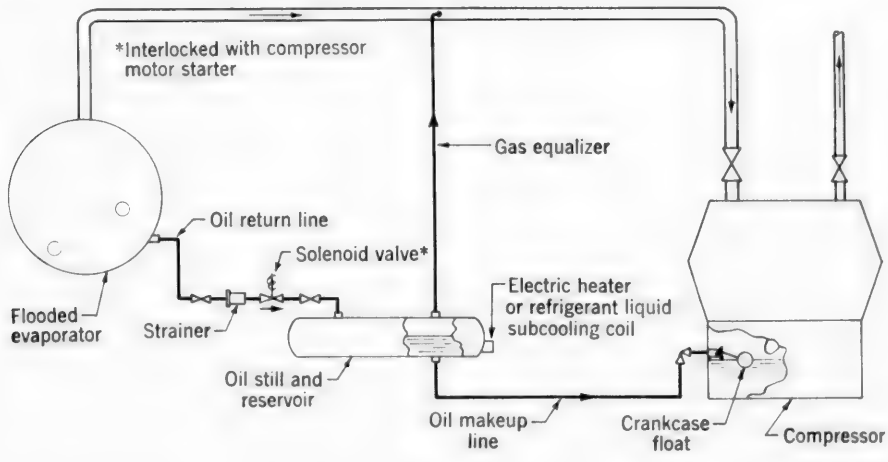


Fig. 3. Oil return from flooded evaporator to oil still.

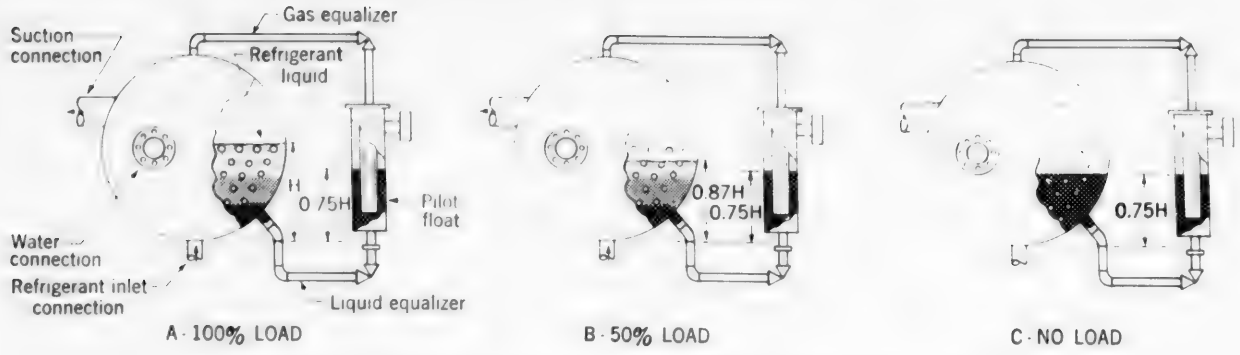


Fig. 4. Refrigerant liquid levels at conditions of full load, half load and no load.

connection on the side of the cooler below the liquid level, a mixture of refrigerant and oil can be drained by gravity from the cooler to the compressor crankcase. Friction heat developed from the rubbing surfaces of the compressor is absorbed by the lubricating oil which recirculates to the crankcase. This heat would normally pass off to the ambient by convection and radiation, but by bleeding a mixture of refrigerant and oil to the warm crankcase, it can be usefully applied to distill the refrigerant from the oil. As the refrigerant liquid becomes heated, it vaporizes and passes through eqaulizing ports to the compressor suction plenum where it is compressed and flows to the condenser. The warm oil remains in solution to lubricate the compressor.

A solenoid valve, protected by a strainer, is provided in the oil return line so that the oil return mechanism may become inoperative when the compressor is not running. A metering device is located downstream from the solenoid valve to prevent an excessive amount of refrigerant from flowing to the compressor during operation.

Another method used on multiple compressor installations and low temperature systems is illustrated in Fig. 3. A combination oil receiver and still may be used. The mixture of refrigerant and oil flowing from the evaporator is returned directly to the receiver. As a source of heat to distill the oil, a refrigerant liquid subcooling coil may be located inside the receiver or an electric heater, thermostatically controlled, may be provided. Refrigerant evaporated by the heat source flows through a gas equalizer line to the compressor suction while the warm oil remains in solution to replenish the compressor crankcase when needed.

Refrigerant Liquid Level

The flooded type cooler is essentially a fixed charge type evaporator. In other words, the refrigerant charge required to wet all of the tube surface at the maximum load condition is the refrigerant charge that should be retained in it for all load conditions. By providing a remote liquid level controller on the cooler, the operating refrigerant charge in the cooler will remain relatively constant from no load to full load. This is illustrated in Fig. 4. The cut-away of the cooler and remote pilot float in detail *A* shows that the pilot float liquid level setting is properly adjusted for 100% load to completely wet all tube surface within the evaporator. Due to the ebullition in the cooler brought about by the boiling action, the foaming liquid level will be higher than the quiescent liquid level in the remote pilot float because no heat is being added to the latter. Since both chambers are gas and liquid equalized, each will establish a liquid level as a function of its column density. In the cooler, the boiling action results in a low density mixture of gas and liquid with the least dense mixture near the top tubes and the more dense liquid at the bottom tubes. Since no heat is added to the pilot float chamber except for heat leakage, it will have a density equal to that of the liquid, and its level will be about 75% of the height in the cooler, measured from the bottom of the cooler shell.

As the load on the evaporator is reduced to 50%, *B* shows the corresponding reduction in liquid level in the cooler. Since the pilot float is controlling the liquid level in the low side of the system, it will tend to retain the same elevation as before (0.75H), while the refrigerant density in the cooler is somewhat greater than at the 100% load condition, resulting in a level of 0.87H. The same number of refrigerant pounds remains in the cooler, but the reduced boiling action causes a lower liquid level, exposing some of the tube surface.

Referring to *C* of Fig. 4, we see a no-load condition where there is no boiling action within the cooler and the liquid levels in both the cooler and the float chamber are equal.

Understanding this phenomena, we can see that it is important to observe the refrigerant level through sight glasses when adjusting the float level, or in charging the refrigerant into the system containing high side float control. Too low a level at full load operation will result in poorer performance than intended. A level setting well above the optimum will increase the refrigerant charge required, adding to the cost of the installation. Exposing some of the tubes for partial load operation does not noticeably penalize the system operation since more tube surface per ton of air conditioning will be provided than at the full load condition, always resulting in a smaller leaving temperature difference for reduced load operation.

If a truly proportioning type float were applied with a large variation in level between the full-open and full-closed position of the float, it is true that the refrigerant charge in the evaporator would be greater for reduced load operation. In actual practice, the operating band throughout which the level controller operates is small, resulting in little change in refrigerant charge throughout the entire operating range.

Control Valves

The refrigerant feed rate to the evaporator may be controlled by either of two methods, high side control or low side control. With the former, all of the refrigerant liquid drained from the condenser is permitted to flow through an expansion device to the evaporator. Low side control is a means of maintaining a liquid level in the evaporator, with any surplus liquid from the condenser stored in either a receiver or the condenser itself.

Figure 5 shows the application of a high pressure float drainer. Refrigerant liquid from the condenser drains to the high pressure float drainer which serves a function similar to that of a steam trap. As liquid builds up in the float chamber, the float ball opens a valve port, permitting refrigerant to expand through it to evaporator pressure. Due to the reduction in pressure, flash gas forms in the liquid line and two-phase flow occurs from the float to the evaporator.

Some float drainers are provided with an internal equalizer which continually bleeds from the high pressure side to the low pressure side, permitting better liquid drainage to the float chamber. This also permits the float to be elevated above the condenser, where desirable.

The high pressure float control is an inexpensive control which is very flexible and dependable. It is capable of modulating at extremely low flow rates and can be used on any single flooded cooler application where the high side refrigerant charge will not vary appreciably.

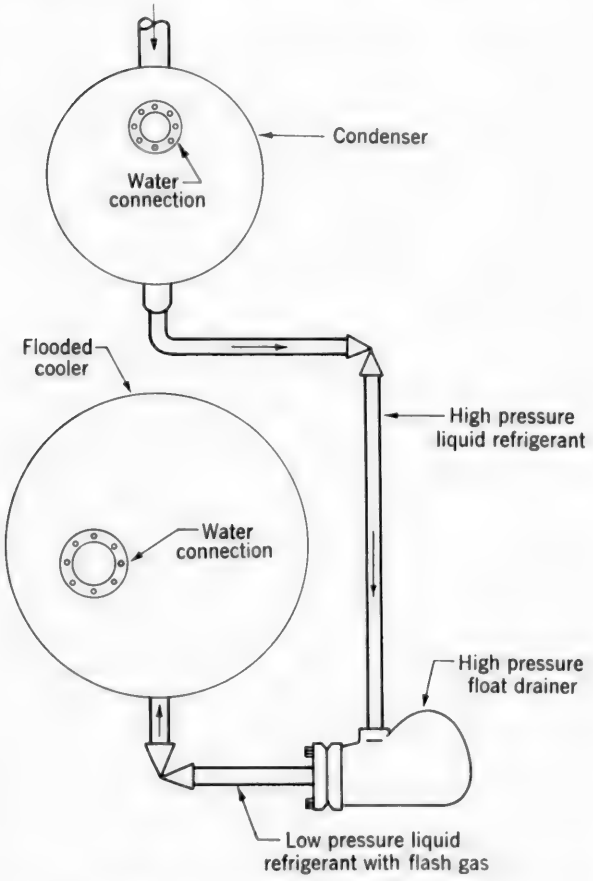


Fig. 5. High side refrigerant control with a direct acting float drainer.

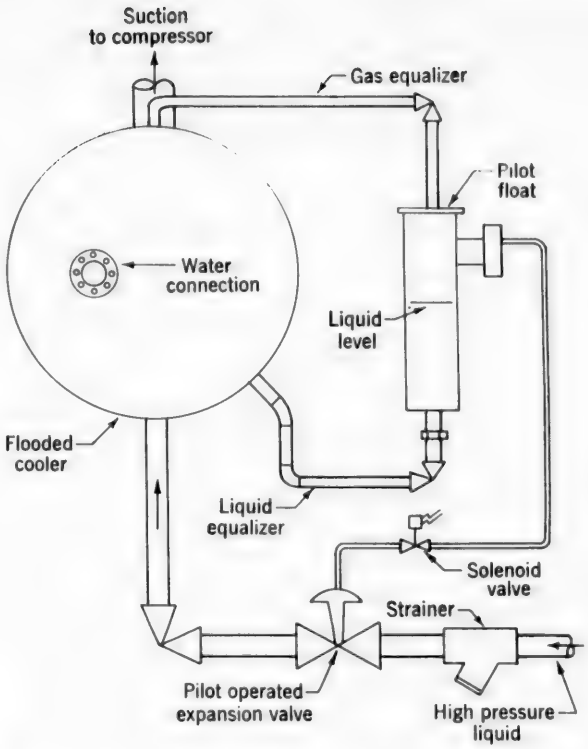


Fig. 6. Low side refrigerant control. Special thermal expansion valve with electric heater at the thermal bulb.

It should not be used on a system containing multiple evaporators since the float control would have no way of knowing the proper amount of refrigerant to feed to each evaporator and this would result in overfeeding one, while starving another. High side control should not be used where a large number of evaporative condensers are included on the high side of the system due to the large refrigerant charge normally required by the evaporative condensers, which would be free to drain to the flooded cooler, possibly overcharging it, during partload operation. No operating receiver is required with the high pressure float control since all of the liquid draining from the condenser flows directly to the evaporator. However, a receiver can be added to the system for pumpout purposes, where desirable.

Two basic types of low side control are commonly used—the electrically heated thermal expansion valve and the pilot float operated expansion valve. Any low side control arrangement will maintain a nearly constant refrigerant charge in the evaporator and means should be provided on the high side of the system to accommodate any variation in refrigerant charge. For instance, if three evaporative condensers are located on a single system, operation on days with low wet bulb temperatures may permit the use of a single condenser with the other two idle. The refrigerant charge from the idle units will drain from the coils and an operating receiver should be provided to store this excess refrigerant.

For the arrangement shown in Fig. 6, a special thermal expansion valve is used, equipped with a small electric heater at the thermal bulb. When the bulb is in contact with liquid refrigerant, thermal conduction between the refrigerant and the bulb is so great that the small electric heater cannot raise the temperature of the refrigerant

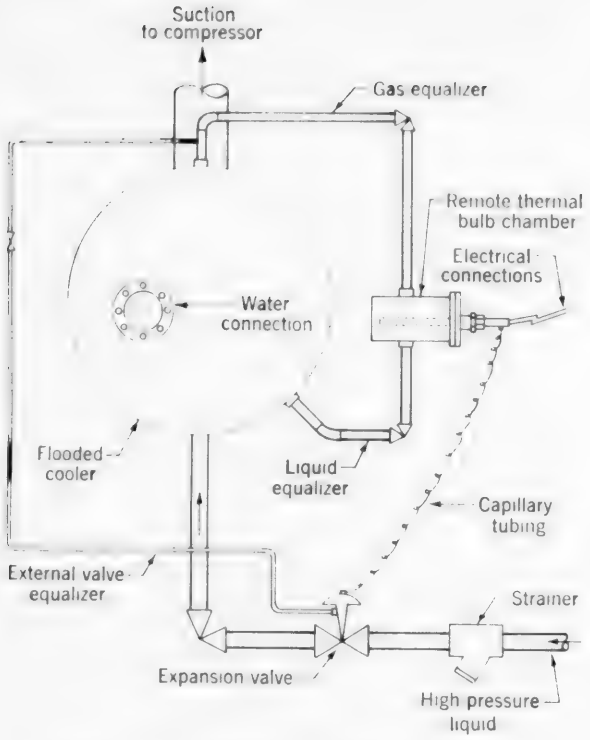


Fig. 7. Low side pilot float refrigerant control.

within the bulb. Without superheat, the expansion valve closes. As the level falls below the thermal bulb, refrigerant vapor only is in contact with the bulb and the heat transfer is poor between the metal and the vapor. Consequently, the electric heater raises the temperature of the bulb so the refrigerant increases in pressure and the expansion valve can open. In this way, the expansion valve modulates to maintain a refrigerant level equal to the bulb elevation.

From the discussion of the phenomena illustrated in Fig. 4, it is evident that by locating the thermal bulb directly in the water cooler, the refrigerant charge would be substantially increased for part load operation, since the expansion device would continue to feed refrigerant until the level in the chiller came in contact with the thermal bulb. To avoid this, a remote chamber with gas and liquid equalizing lines should be connected to the cooler and the level controlled at a height of between 70 and 80% of the distance between the top of the tube bundle and the bottom of the shell. For instance on a 20-inch diameter cooler, with tubes to the centerline, the thermal bulb would be located at a level of approximately 7½-inches above the bottom of the cooler shell.

Some adjustable means should be incorporated so that the bulb can be relocated at a slightly higher or lower elevation to obtain the optimum level, without changing the piping. Our method of doing this has been to drill and to tap a hole in a blank flange, off center for insertion of the bulb, and by rotating the flange, up to eight different elevations can be obtained. Of course, service valves should be located in the equalizer lines so that the bulb chamber can be isolated while relocating the bulb or for servicing the expansion valve.

It is particularly important that the liquid equalizing connection be made on the side of the cooler above the distributor plate. In order for the remote control to feel the precise static liquid level in the cooler, it is important that both gas and liquid pressure equalizing points be at the same pressure except for the static head of the liquid. If the liquid equalizing connection were below the distributor plate, the higher pressure in this area, due to pressure drop through the distributor plate, would raise the level in the remote chamber, causing the expansion valve to close. This would result in a continuously starved evaporator. The servicemen would then attempt to raise the level in the remote chamber but even if he found a proper level for one load condition, the flooded water cooler would be overcharged with refrigerant liquid during part load operation.

An external valve equalizer is shown in Fig. 6 and this may or may not be necessary, depending on the application. The purpose of the external equalizer is to permit the diaphragm of the expansion valve to oppose bulb pressure, due to temperature, with the true evaporator pressure. Pressure drop for two-phase flow in the line downstream from the expansion valve is quite high and there is some pressure loss through the distributor plate in the cooler. Consequently, if there is any question whether or not an external equalizer is necessary, it may be well to include it since it will never be harmful to the system operation, and in many cases will be necessary. If provided, it is prudent to include a service valve in the ¼-inch O.D. valve equalizing line so that the expansion valve can be removed from the system without pumping out the evaporator.

Another type of low side control is illustrated in Fig. 7. Here a pilot float is located external to the cooler with separate gas and liquid equalizing lines so it may accurately control a nearly constant refrigerant charge in the flooded cooler. The function of the float is to open the expansion valve when the level in it falls and to close the valve when the level rises. Several different types of float and expansion valve combinations are available so these will not be discussed in detail. Basically, they may be divided into two groups, one where the refrigerant itself is used to actuate the expansion valve and on the other, air is used as the control medium. As the float changes position, the refrigerant or air pressure exerted on the valve diaphragm or control piston changes so that the valve may modulate in a more nearly closed or more nearly open position. By locating a solenoid valve in the pilot line, a single seated valve can be positioned for the full closed position when the solenoid valve is not energized. Therefore, a main liquid line solenoid valve is not generally necessary to provide tight close-off during system shutdown, as a small (usually ⅜-inch O.D.) pilot solenoid valve will accomplish the same purpose.

Most pilot type floats are equipped with an externally adjustable means for varying the liquid level control point. However, the amount of variation available is limited and an attempt should be made to locate the float chamber at a height fairly close to that required for normal operation. The level adjustment means can then be used to seek the most favorable level within its adjustable range. The nominal level should be set about the same height as described for the arrangement shown in Fig. 6. It is again important that the liquid equalizing connection at the cooler be made above the distributor plate.

BRI holds meeting to discuss

Air Cleaning and Purification

Summaries of papers presented at a special session during the Spring Conference of the Building Research Institute held in New York City. Various aspects of this subject were presented by many speakers.

SEVERAL group meetings on subjects pertaining to buildings, were part of the Spring Conference of the Building Research Institute that was held at the Statler-Hilton Hotel, New York, N. Y., on April 5 to 7. The topics covered were paints and coatings, proposal for new building research, insulated masonry cavity walls, performance of buildings, adhesives in buildings, plastics, and air cleaning and purification. Papers on the last topic, that were given at the meeting on April 6, are summarized as is part of this conference report.

John E. Haines, vice president, Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., was chairman of this special session.

Pure Air

A paper on What Is Pure Air? was read by Arthur J. Hess, president, Hess, Greiner & Pollard, Los Angeles, Calif.

Two different groups of engineers are working on the problem of smog. One is attacking the source of pollution so that the pollutants are prevented from forming, and the other is attacking the problem by removing the pollution from air streams used in the ventilating and air conditioning of buildings. The economic benefits of clean air are generally known to the engineer.

It is possible to remove most of the particulate matter from the air by strainer type filter or by water sprays. The filters are not too expensive nor costly to operate, and will remove to 90% of the dirt by weight. Other filters, more expensive, can take out a higher percentage of the dirt. Gases are a different problem and can be handled by activated carbon. He said that the industry needs more research on the problem of removing bacteria from air streams. At present, glycols, lithium chloride, ultraviolet light and electrostatic filters are being used.

Odors

H. L. Barnebey, vice president, Barnebey-Cheney Company, Columbus, Ohio, spoke on Odors—Classification, Detection and Removal.

A little odor can go a long ways for some substances can produce a sensation of odor in dilutions of one part in a hundred billion. Odors are not the cause of organic disease but they can cause discomfort. Activated charcoal adsorption is a widely used method of air treatment which will efficiently and completely eliminate all odor producing substances, even though they are present in low concentrations.

"We have not developed an instrument for odor detection or measurement. We must rely upon appraisal by the human nose." There are a number of mechanical devices based on diluting odors of air samples to the threshold values.

Tests were conducted in a large number of buildings and it was found that oxygen and CO_2 content are not problems. Sufficient air comes in by infiltration or with the opening and closing of doors to keep these gases within the proper range.

An excellent approach to air purity in occupied space is to establish a specification for air quality and then to use whatever system supplies air of these specifications, at the lowest cost. A suggested specification may be oxygen content, 18 to 21%; carbon dioxide, 0.6% maximum; dust and other particulate matter, .05 grains per 1000 of max.; bacterial count, 5 per 10 cu ft. max.; odor, 20 ppm or 2 thresholds, max.

Air Contaminant Removal

In a paper on Origin and Removal of Air Contaminants by Louis C. McCabe, president, Resources Research, Inc., Washington, D. C., he covered the variety of pollutants due to human activities and a study of dustfall in large cities.

Although air pollution can be effectively controlled at the source, with the increase in industrial and other human activities, the amount of pollution that tends to escape tends to grow in spite of the most effective means of control at the source.

Bacteriological Problems

Information on Bacteriological Problems Associated with Air Handling Systems in Hospitals was presented by V. W. Greene, assistant professor, School of Public Health, E. G. Bond, professor, School of Public Health and G. S. Michaelsen, associate professor, School of Public Health, University of Minnesota, Minneapolis, Minn.

Pathogenic bacteria can be introduced into the air at a considerable distance from susceptible patients and can be transported to these hosts by means of air currents and inert airborne particulate matter.

In addition to controlling the direction of flow of contaminated air, a hospital ventilation system should be designed to eliminate these bacteria, rather than merely push them around. One way is to dilute the contaminated air with pure air.

Techniques for air purification, insofar as bacteria are concerned, fall into the following major categories: Mechanical and adhesive filters; chemical germicides; ultraviolet radiation, and electronic air cleaners.

The authors stated, "We hope that airflow design will in the future take cognizance of the septic air streams

that can result from haphazard or ill considered planning. Perhaps a combination of building design and construction will be forthcoming that will reduce the potential hazards of these bacteria.

Total Air Treatment

William L. McGrath, chief engineer, Unitary Equipment Division, Carrier Corp., Syracuse, N. Y., spoke on Total Air Treatment. By total treatment, is meant the following specific objectives:

1. Heating when needed and to the degree needed.
2. Cooling when needed and to the degree needed.
3. Humidifying when needed and to the degree needed.
4. Dehumidifying when needed and to the degree needed.
5. Constant removal of dirt and dust.
6. Constant removal of pollen, spores and other allergens.
7. Constant removal of odors created within the space.
8. Constant removal of airborne bacteria and virus organisms.
9. Constant removal of air contamination due to leakage of outside air into the building.

He recommends that total air treatment be accepted as a key principle in the design of schools, offices, factories, hotels and homes. Industries having to do with air conditioning and treatment have an important objective in developing even better equipment.

With total air treatment, windows will have no possible utility other than a scenic diversion. This would permit the design of a building that would be more functional and of greater utility, and the building could be constructed at lower cost.

A house could be designed to take better advantage of a site. There would be windowless walls where indicated and scenic views provided in the directions where it is important. While not particularly recommending windowless buildings, the point that was made, was that the designer would acquire a new degree of freedom.

Future Methods

Finn J. Larsen, vice president of research, Minneapolis-Honeywell Company, presented a paper on Future Methods of Air Purification. He stated that many research scientists believe that we are just beginning to have an insight into some very interesting possibilities. If eventually we are successful in achieving complete control of our indoor atmosphere, we might be able to do more than simulate various outdoor atmospheres. Instead of feeling dull and irritable, it might be possible to select an exhilarating and invigorating atmosphere, and at least be able to modify the depressed attitude. It might even be able to properly select an atmosphere so that a nervous person could feel more relaxed and less tired at the end of a day. If this becomes possible, then our air conditioning systems will be approaching their golden age.

Building Owners Comment on Operation

The Operation and Maintenance Committee of the Building Research Institute sent out questionnaires on which to base a report covering institutional buildings. While this report covered a wide field including architectural and structural, a number of the questions related to the mechanical part of the building.

Of the replies received, 90% of all owners are generally satisfied with heating systems in structures built since World War II. While three stated that their central heating plants were highly satisfactory and efficient, 50% of all owners indicated that was need for improvement in temperature control systems.

About 85% are satisfied with modern plumbing systems in buildings. Areas of needed improvement include: Eliminate grease traps, water treatment systems; reduce noise in flush valves and water closets; laboratory drainage systems; building codes for plumbing are outmoded: soap dispensing systems; leaky faucets.

Owner comments on central air conditioning systems were limited to about 10% of the questionnaires and therefore the returns are considered inconclusive. However, two owners commented favorably on a chilled water dual duct system and two commented favorably on what may be considered to be the dual duct system.

A total of 35% of the owners said that fan duct noises were excessive in ventilating systems and should be reduced; 25% stated that fan vibration was objectionable, and about the same number commented that metal duct work, in general, should be improved upon through new materials, or coating or covering the bare metal.

An interesting sidelight to this survey is that dealing with lighting since lighting intensity has a direct bearing on the air conditioning load because of the internal heat gain in the building. About 50% of the replies gave the following optimum lighting intensity in foot candles for various parts of institutional buildings:

Classrooms	40
Laboratories	100
Libraries	50 to 75
Lecture halls	30
Patient bedrooms	15
Corridors	10
Lounge areas	35
Offices	50 to 75

A total of 60% of the owners stated that original electrical service facilities had proven inadequate while only 12% stated that the facilities were satisfactory. These comments applied to transformers, lighting and power panels and the distribution system.

In general the following comments by owners should be given consideration:

Crowded and inaccessible mechanical equipment.
More and better supervision during construction.
Inaccessible piping, valves, etc.
Insufficient time allowed during design stage.

ACHV BUILDING TYPE SECTION

Air Conditioning and Heating the Supermarket

W. A. ZUMBIEL
Engineering Department, The Kroger Co., Cincinnati, Ohio

Unlike other air conditioning applications, simplification of design is very important for systems installed in supermarkets. How this is done and the design factors that one must follow are covered in this article. The Kroger Company, the third largest food chain in the United States, has 1400 stores operating in 20 states.

Air Conditioning and Heating the Supermarket

W. A. ZUMBIEL
Engineering Department, The Kroger Co., Cincinnati, Ohio

The Kroger Company, which is the third largest food chain in the United States, has a total of 1400 stores which are operating in 20 states. During the years, this chain has developed considerable experience in the proper design of air conditioning and heating systems for supermarkets. A large amount of practical design information is presented in this article and an insight of some of the design problems that must be overcome.

SUPERMARKETS as we know them today are a far cry from the neighborhood grocery and butcher shops of 25 to 30 years ago. The small stores, which existed then, ranging in size from 1500 sq ft to 3000 sq ft, were considered to be modern for that era. Air conditioning in these stores was non-existent and the heating systems in most of the buildings consisted of a pot-bellied stove at the rear of the store, or possibly a gravity type hot air furnace in the basement.

The supermarket of today ranges in size from 9,000 sq ft to 40,000 sq ft. These stores handle almost every conceivable food item plus non-food items that the average housewife has come to expect in a store of this type. The modern supermarket is completely air conditioned, usually combining the heating and cooling equipment into one complete system.

There were very few air conditioned supermarkets 12 to 15 years ago. Of these early air conditioned markets, practically all were equipped with floor-mounted packaged units of 3, 5, and 7½-ton capacity. At that time the 7½-ton air conditioner was considered a large unit. In the early days of air conditioning, the back room and stock area were not cooled. In a store of approximately 6,500 sq ft, 1,500 sq ft would be used for stock and cooler space. The remaining 5,000 sq ft of sales area would be air conditioned with two 7½-ton package units along one side wall. One unit would be located adjacent to the second unit placed approximately half way between the front wall and crossover partition dividing the sales area and back room. These units were equipped with plenum chambers for free air blow with no duct system being used. These stores were heated with gas unit heaters suspended in the sales and stock room area. Where natural gas was not available, manufactured gas or oil-fired units were used.

Introduction of Central System

As the supermarket became larger two things became evident.

1. Due to increasing sales and a greater number and variety of products being developed, the sales area became more and more valuable making it necessary to use as much of this space as possible for display of merchandise.

2. With the larger and wider stores being constructed, a greater number of packaged units were required.

It became difficult to locate these package units where they could do the most good due to their limited air distribution. Also, a greater number of open refrigerated fixtures were coming into use taking more wall space, thereby limiting the space available for air conditioning units. Drafts from discharge and return air also became a greater problem due to these open fixtures. Many of the modern supermarkets of today are equipped with a central built-up system combining heating and cooling. While this type of system does an efficient job, we have found through experience that it also has a number of disadvantages both in installation and operation.

Possibly if a company has relatively few stores to be installed in a period of time, a built-up system could be used, and only if complete detailed installation instructions and adequate supervision were available along with

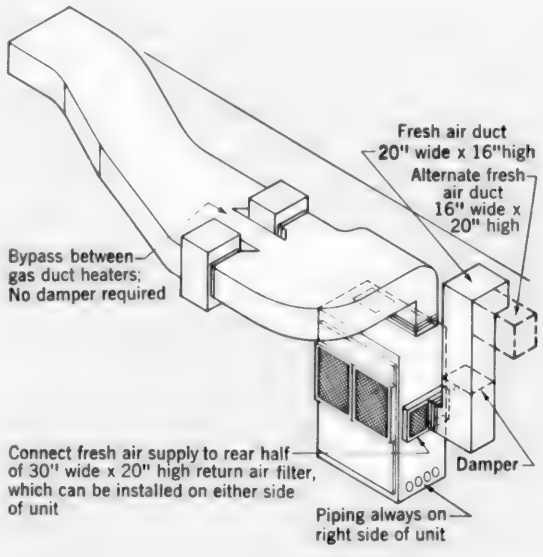

Fresh air duct
20" wide x 16"high
Alternate fresh-air duct
16" wide x 20" high
Bypass between gas duct heaters; No damper required
Connect fresh air supply to rear half of 30" wide x 20" high return air filter, which can be installed on either side of unit
Damper
Piping always on right side of unit

Fig. 1. Typical air conditioning unit with gas duct heaters.

W. A. Zumbiel does all of the designing and engineering of the air conditioning, heating and refrigeration systems for the supermarkets of The Kroger Company. He has been with this company for the past 12 years although, including the time spent in air conditioning and refrigeration while with the U. S. Army, he has been in this field for 21 years.

a first class installation. With a built-up system there are many divided responsibilities. Many times the system is designed by a mechanical engineering company, installed by a contracting firm using a number of installation men. The various components, such as compressor, condenser, air handling unit or units, expansion valves and piping, must be matched, properly sized, and made to work together. Should trouble arise during installation or after the system has been put into operation, it is often difficult to pin down the responsibility.

For the past eight years we have been using packaged air conditioning units ranging in size from 15 to 30 tons. With the installation of a system using packaged type equipment, the number of individuals involved is greatly reduced. If trouble should arise, the system has been either improperly designed or the packaged unit is at fault. The manufacturer of the packaged unit has complete control over the design of the unit and is responsible for the proper operation of the unit. The packaged type of installation is also less expensive than a central built-up system.

Costs are always a major factor in this business as well as in every other business today. With field labor becoming harder to obtain and with labor costs rising, the trend is to more factory assembled, pre-wired, pre-piped equipment. This simplifies the installation and also makes for easier and faster servicing of the equipment. A supermarket requiring, for example, 40 tons of cooling would use two 20-ton units placed in the back room of the store. The units are located near the rear wall of the store with a duct system running down each side wall, or behind the side stock room partitions, where they exist, to the front of the store. The stock area as well as all work areas are now air conditioned. As indicated in Fig. 1, no return air ducts are connected to the units, thereby allowing the rear areas to be cooled by return air. A minimum of outside air is introduced into these units, although this varies with local codes. In a supermarket, delivery doors

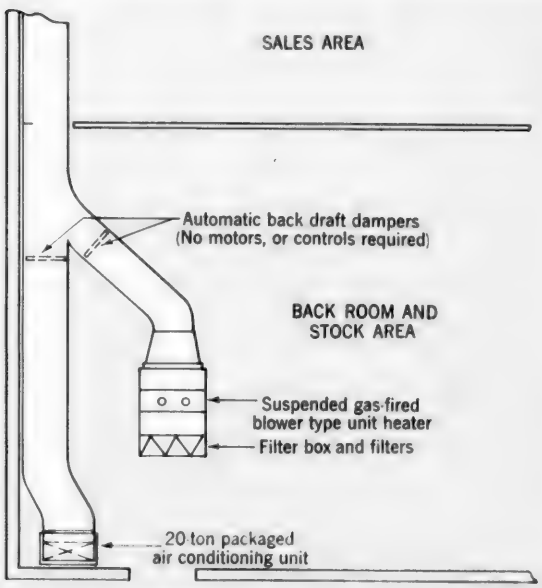


Fig. 2. Suspended gas blower type furnace with air conditioning unit on floor.

are open much of the time, also the front doors open and close many times during a day. This traffic allows many air changes and many times prevents the desired build up of pressure within the store through introduction of outside air into the air conditioning units.

Heating Systems

Heating the modern supermarket is usually accomplished by using the same air handling equipment and distribution system that is used for cooling. Some markets use hot water boilers with water coils in the air handling unit, steam boilers also using the air handling unit, or direct fired equipment such as duct heaters or horizontal hot air furnaces. Using hot water or steam boilers has certain advantages when a number of separate areas must be heated. However, for supermarket requirements, we have found the direct fired equipment to be our number one choice for the following reasons.

1. The direct fired duct heater or furnace system is less expensive to install since it requires no special enclosure such as a boiler or furnace room.
2. No water or steam piping is required which also reduces the cost.
3. The hot air equipment itself is less expensive.
4. Maintenance requirements on a boiler system are usually greater than on a direct fired hot air system.
5. Most supermarkets are of one story design which means that flues for duct heaters or furnaces can be taken through the roof at almost any point.

Figure 1 shows a typical duct heater installation in conjunction with a packaged air conditioning unit. There has been much discussion regarding the location of the duct heater in the air distribution system, upstream or downstream of the air conditioning unit, and some cities have codes covering this matter. Our standard installation is to install the gas duct heater downstream from the air conditioning unit without a full bypass. We size the duct system to handle, for example, 8,000 cfm of air. A small bypass is used, Fig. 1, and sized to allow a certain percent of air to pass between the heaters. In many areas where small heaters are required, or possibly only one heater is needed, 8,000 cfm could not be passed through this area. To overcome this we allow this air to bypass the heater summer and winter, giving us a fixed static and temperature rise through the heaters.

We have always specified a duct heater that uses a ceramic coated heat exchanger assembly. Where con-

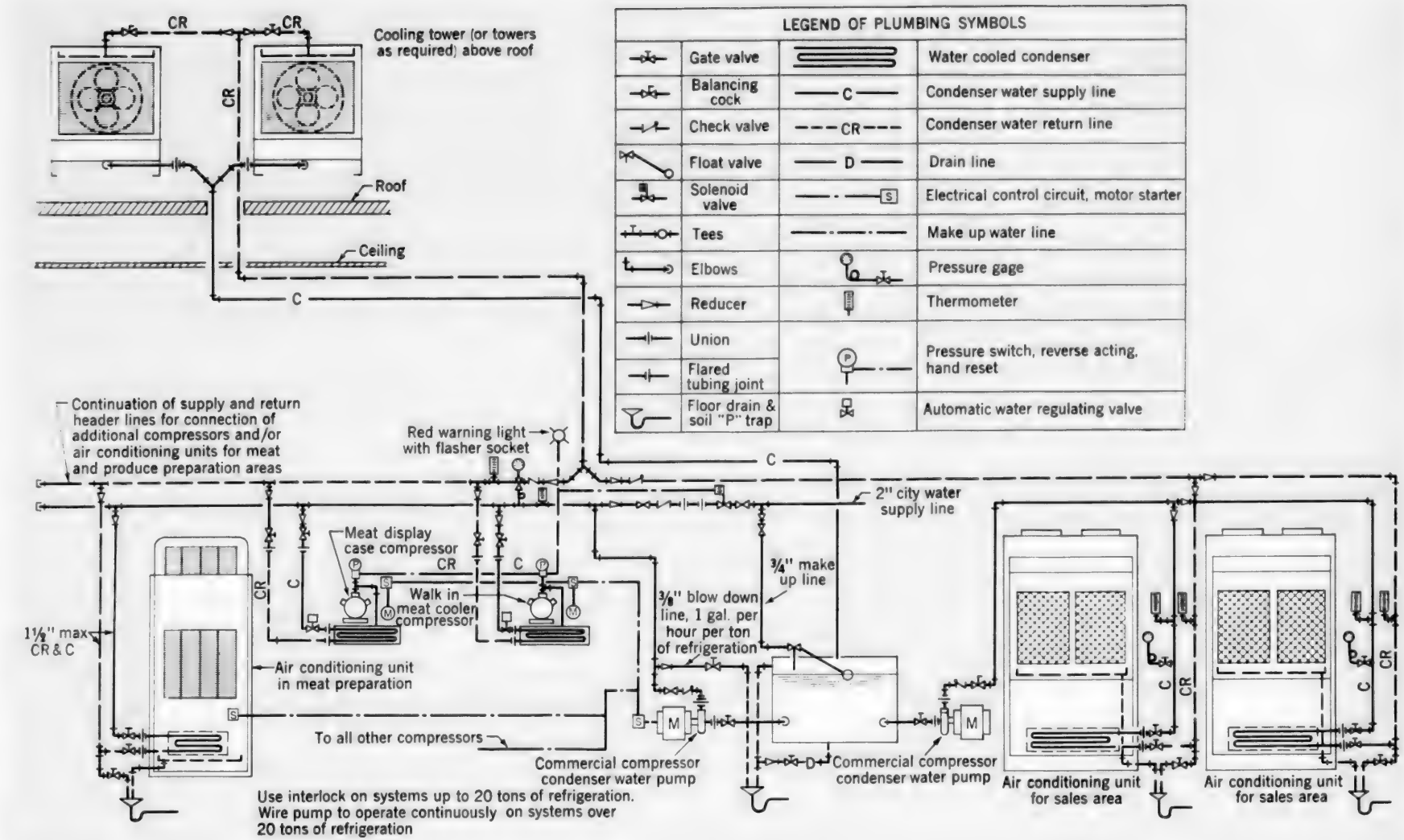


Fig. 3. Typical cooling tower piping layout for air conditioning and refrigeration using dual towers with common indoor water tank.

densation has occurred in the heater, the ceramic has prevented the water from reaching the metal heat exchanger assembly, thus preventing rusting that would eventually eat through the unit. The fact that the air conditioning unit, duct heater and sheet metal duct system are all in the air conditioned back room helps to prevent condensation. We have never had to replace a heat exchanger assembly due to rusting.

Where duct heaters are not used, due to code or for some other reason, although gas is available, we use a gas-fired blower type unit heater, Fig. 2. This heater is suspended from the ceiling with a duct running from the heater or heaters to the main distribution duct. A few years ago we used motor operated dampers in the ducts. In line with trying to simplify the installation, we are now using back draft type dampers. This has eliminated a certain amount of wiring, simplified the control system, and has made this phase of the system foolproof. Many times the motor operated dampers would not work properly due to misalignment of the damper motor or damper arms and linkage, and frequently to improper wiring of the damper motors.

Where gas is not available we install oil-fired suspended furnaces. This system is similar to the one just described, with the oil furnace having its own blower and using the back draft type dampers in the duct from the heater and the main distribution duct. With the oil system, however, an oil booster pump is used to assure an adequate supply of oil to all furnaces at all times. This booster pump is wired to operate when the control system is turned to the heat position. With possibly two oil furnaces furnishing heat into the two main distribution systems (one duct down each side of the store) and one small oil furnace supplying heat to the delivery area with its own thermostat, oil will be available regardless of which thermostats may be on or off.

Sizing for the Load

Many methods have been used in the sizing of air conditioning and heating equipment for supermarkets. The conventional method is to use the heat loss and heat gain forms, calculating lighting load, outside air entering the building, people load, etc. Through experience we have been able to set up charts giving the amount of heat or cooling required for every size building in all areas of the country from southern Texas to northern Michigan. We specify the insulating factor for roof or ceiling insulation for this is a major factor in air conditioning and heating.

The method we use is set up on a square foot basis. The entire area of the store including the sales area and stock room area is included. As an example, in figuring the cooling equipment required, the average would be 350 sq ft per ton. This covers the central section of the country; however, the southernmost sections would drop to 300 sq ft per ton and the northern areas would rise to 400 sq ft per ton. The greatest cooling load in any supermarket is the front section of the store. This is due to the glass, entrance area, and the concentration of customers at the checkout counters. To overcome the concentrated load in this area, we discharge at least 50% of the air into the front third of the sales area. If the store happens to be in a shopping center with stores adjoining, the square foot figure for cooling may be increased, with the heating equipment being cut in size proportionately. The above figure of 300 to 400 sq ft per ton takes into consideration the lighting in the store as well as the open refrigerated fixtures. Most of our stores have the same general type of lighting as well as the same number of open fixtures in proportion to the store size. Our refrigeration equipment is sized with the understanding that the store will be air conditioned. This allows us to pick condensing units based on a 78 deg F room rather than a 90 deg room. If we cut the size of the air conditioning equipment on the assumption that we would pick up some extra cooling from the spill-over from the fixtures, we would be in trouble during hot weather.

More stores are using barbecue machines and pie ovens. These items add somewhat to the cooling load. However, we have not had to revise our standard calculation charts due to this added load since we have based our figures somewhat on the safe side anticipating this type of added load.

Odors

Although the modern supermarket has a great number and variety of food products on display, no serious problem has occurred with food odors in the store. This is not always true, however, when a fresh fish department is incorporated into the store operation. The use of pie baking ovens and barbecue machines also presents somewhat of a problem with odors and ventilation. A separate ventilating system is always installed in the fish preparation area to try and remove or at least confine as much of the odors as possible to that area. The same is true of ovens and barbecue machines. There are some, however, who feel that odors from pie ovens and other food preparation machines, if not too strong, might be pleasing to the customer. The design of most air conditioning and heating systems is such that should objectionable odors become excessive, these odors are carried throughout the store by the air distribution system. We are at the present time experimenting with various types of air purification equipment. One of the more promising seems to be the activated charcoal filters that can be used in conjunction with the air conditioning equipment. In addition to removing odors, on certain types of installations we can also reduce the amount of outside air being brought into the store. I feel that the term "fresh air," as generally used is somewhat of a misnomer since there are very few areas today in which truly fresh air can be obtained. The term "outside air" I believe is a truer statement than the term "fresh air".

Cooling Towers

For a number of years many of the earlier air conditioned supermarkets used air conditioning equipment that had no water saving devices, such as cooling towers or evaporative condensers. As water costs rose, and in some areas water actually became scarce, many cities passed ordinances to prevent the use of air conditioning equipment without some type of water saving device. The cooling tower is the most widely used water saving device in supermarket air conditioning. In conventional cooling

tower use, it is necessary to fill the tower and system in the spring and then drain the complete system in the fall after the cooling season. To eliminate this problem we have combined the cooling tower operation for both air conditioning and refrigeration into one large cooling tower system.

To prevent freezing in the tower during the winter and to eliminate the necessity of draining the tower or towers and piping, an indoor open type storage tank is used to supply condensing water to both the air conditioning system and the commercial refrigeration units the year around. This system is shown in Fig. 3. Each system has its own water circulating pump with a common return line to the towers. We prefer a twin tower installation as shown in Fig. 3 due to the flexibility it affords. Except during the hottest period of the year, one tower can be shut down and cleaned or repaired while the other tower handles the combined load. Using two towers of the same size assures a balanced supply of return water from all condensers. Should towers of unequal size be used, one tower could possibly be starved while the other would be overloaded with more water returning to it than called for by its design. Using hand valves to try and balance the amount of water returned to the towers proves unsatisfactory due to the wear on the valves plus corrosion, etc., that eventually allows more water through one valve than the other or completely stops the valve.

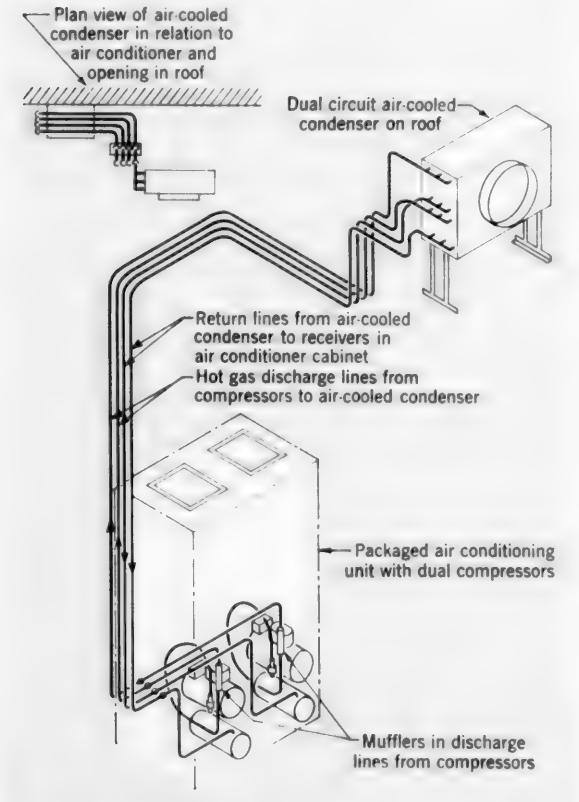

Plan view of air-cooled condenser in relation to air conditioner and opening in roof
Dual circuit air-cooled condenser on roof
Return lines from air-cooled condenser to receivers in air conditioner cabinet
Hot gas discharge lines from compressors to air-cooled condenser
Packaged air conditioning unit with dual compressors
Mufflers in discharge lines from compressors

Fig. 4. Schematic refrigerant piping between air conditioning unit and remote air cooled condenser using mufflers in discharge lines at compressors.

Use of Air Cooled Condensers

Within the last few years the use of air cooled condensers has returned to favor. Condensing refrigerant by using air was actually used many years ago but due to space limitations within basements and the relatively small tonnage condensing units available, water cooled equipment took over. Today there is no limitation to the size of an installation that can be made using air cooled condensers. Many of the supermarkets now being installed are using air cooled condensers in conjunction with their air conditioning or refrigeration equipment or both.

Every store that we install is set up to use air cooled condensing equipment. The sizing of air cooled condensers depends largely on the geographical area in which the store is to be located. This also applies, of course, to the cooling tower sizing discussed previously. It has been said by some that using air cooled condensers would cut the capacity of the air conditioning system making it necessary to somewhat oversize the air conditioning equipment. If the air cooled condensers are sized properly for the location in which they will be used, no reduction of capacity will be encountered. Certain contractors and consultants in trying to cut costs have undersized condensers causing the system to fail when it is needed most. This practice has given some air cooled equipment somewhat of a bad name causing potential users of air cooled equipment to become skeptical. When a purchaser of air conditioning equipment realizes that he must, in effect, live with an installation for say 20 years, it is obviously very foolish to cut costs beyond reason.

Most air cooled condensers are located outdoors on the roof of the supermarket. This provides an ample supply of air without restriction. We believe this to be the best location. On certain installations it is necessary, due to local zoning or architectural design, to conceal this equipment.

Locating the condensers at grade level requires protection from vandalism, also truck and customer traffic. Placing the condensers indoors adds to the installation costs due to air intake and exhaust duct work required as well as the cost of partitions, platforms, plus the floor space itself. Many supermarkets are locating the larger air cooled condensing units or high sides outdoors with the air handling unit (low sides) suspended from the ceiling in the sales area or back room. Where remote condensers are used, we have made it a practice to use mufflers in a discharge line off the compressor. A typical refrigerant piping diagram using mufflers is shown in Fig. 4. The use of mufflers tends to reduce pulsation noise and reduces the chance of line breakage due to pulsation beyond the compressor. Winter controls are usually not required for air conditioning systems with air cooled condensers when the system is not operated in extremely cold weather. However, as a precautionary measure, a reverse action pressure control can be installed at the air conditioning unit to keep the condenser fan motor off until the air conditioning unit has had a chance to build up a head pressure.

Although an air conditioning installation using air cooled condensers will cost approximately the same as a system using cooling tower, tank, pump, etc., the great

advantage of the air cooled installation is in reduction of maintenance. No cleaning is required as with a cooling tower and since no water is used, no water treatment is necessary. The only maintenance required is the periodic check that we strongly recommend for all types and makes of equipment in a supermarket. With the thousands of dollars invested in a store, it is penny wise and pound foolish to allow this equipment to operate unattended until it fails.

Control Systems

The control systems used with our air conditioning and heating equipment are designed, keeping in mind our policy of standardization and simplification. As mentioned earlier in this article, we use three basic types of heating systems in conjunction with our packaged air conditioning units. To allow field personnel to make fast and efficient control installations, we send with the complete air conditioning and heating plans, a simplified wiring diagram, Fig. 5. This diagram is used with a packaged air conditioning unit, remote air cooled condenser and gas duct heater. Included is a control panel (CP-1) located in the sales area of the store, a relay panel and a power box (reduction from 115 V to 24 V), both located at the air conditioning unit. Although the internal wiring of the control and relay panels is not pertinent to the actual installation, inside the relay box cover is a wiring diagram of the components in this panel. This information is used in the event service is required in the panel, which is very unlikely. One size and type of plug-in relay is used to simplify replacement if this becomes necessary. This also cuts inventory and eliminates the possibility of an improper relay being used. This type of control system is used both with air cooled condensers or cooling towers. Terminals *A* and *B*, as shown in Fig. 5, can be connected to the starter of the tower or condenser fan motor. The control equipment for the system using oil-fired heaters and blower type gas heaters is the same except for additional relays for the additional motors being used on the heating units and the oil booster pump. When auxiliary heat is used at the delivery doors and entrance area, simple thermostats or on-off toggle switches are located in that area to control those heating units. With this type of control system, the store manager does not worry about valves, condensing water, cooling tower operation, boilers or circulating pumps. He has but one selector switch to operate. At any time of the year he can have cooling, heating or ventilation by turning the selector switch from off to fan-cooling or heating. There are many systems of control that are much more elaborate and complicated than the one just described. Some go so far as to make the complete system fully automatic using indoor-outdoor type of thermostats. We feel that the store manager, who after all is responsible for his complete store operation, should have the responsibility of selecting the proper conditions within the store.

The cost of combination air conditioning and heating systems vary widely. Much depends on the type of system installed and how elaborate the system might be. Using

SELECTOR SWITCH FUNCTIONS				
Switch position	A. C. unit blower	A. C. unit compressor	Air cooled condenser	Gas duct heaters
Off	Off	Off	Off	Off
Fan	On	Off	Off	Off
Cool	On	Therm. control	Therm. control	Off
Heat	On	Off	Off	Therm. control

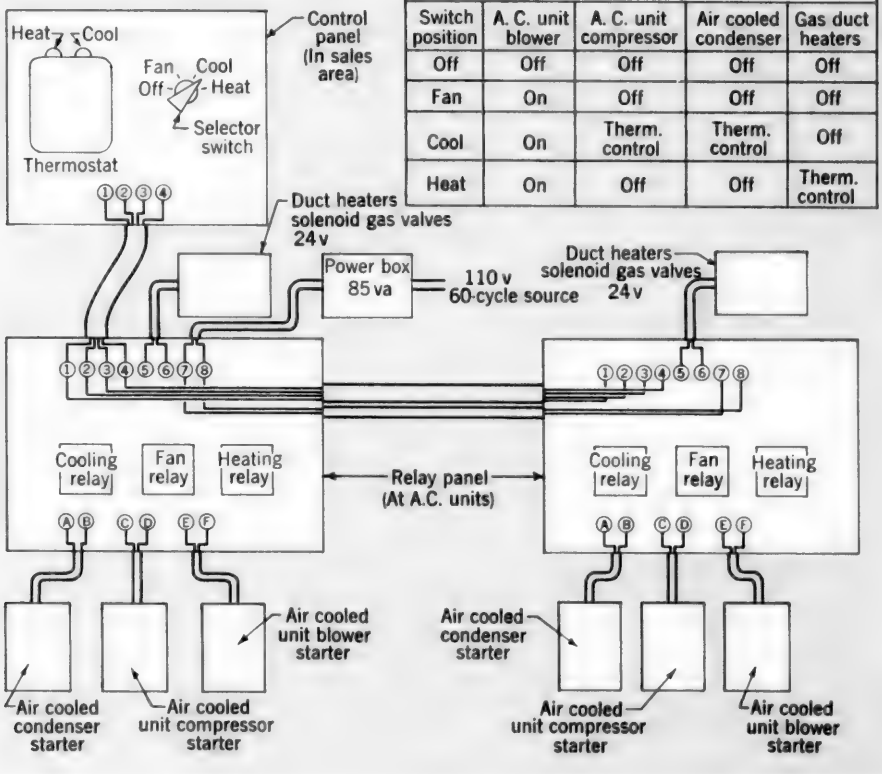


Fig. 5. Typical control panels and necessary field wiring.

packaged equipment of the larger tonnages has in addition to simplifying our installations, reduced the initial cost. A figure of $400 per ton of air conditioning was standard in the industry for years. Today we have made many installations where the $400 per ton includes a complete heating system. There are many supermarkets of the 9,000 to 12,000 sq ft size that are air conditioned and heated for approximately $1 per sq ft. As the stores become larger, the cost is reduced proportionately. As mentioned before, much depends on the type of system installed. After all, in air conditioning and heating a supermarket, we want a good cooling and heating job with adequate ventilation. There is no need for a large complicated system with costly boilers, boiler rooms, chillers and elaborate control systems that require extensive maintenance and almost constant attention.

Heating Entrance Areas

The section of a supermarket most difficult to heat is the checkout and entrance area. This is due mainly to the automatic doors used in the modern supermarket. Pushing carts through the doors over automatic carpets keeps the doors open for long periods, allowing cold drafts to enter the store. There are ways to at least partially prevent this condition from occurring. Many stores in the more northern section of the country are constructed with vestibules. The vestibules are heated to a rather high temperature to try and temper the cold air entering the building. The vestibule must be large enough so that automatic carpets are separated sufficiently so that when a customer pushes a cart over one carpet the inner door is practically closed before the outdoor door opens. Needless to say, with a steady stream of customers entering and leaving both the inner and outer doors of the vestibule will remain open much of the time. Some stores use auxiliary heat in the front of the store at the checkout and entrance area. This works reasonably well. However, to overcome cold drafts, this heat must be instantaneous and at times this is difficult to control.

A new type of entrance used in recent years in this country is the air curtain door. This type of entrance uses a heating unit built into the recirculated air system to temper the outside air that enters the opening. Motorized louvers are built into the top of the entrance and automatically adjust to counteract blasts of cold air trying to enter the store. This type door, after additional refinements are made, may well become standard equipment on supermarkets of the future. Infra-red radiant heating is being tried in some supermarkets. Gas-fired or electric radiant heaters are recessed in the ceiling over the checkout area and at the glass areas. Although the radiant heaters do not heat the air directly, they heat any person or object in line with the infra-red ray. The floor and equipment is thus heated and in turn this heats the surrounding air. This type of spot heating is still very experimental, but it has possibilities for the future. The use of waste heat from the refrigeration condensers to help heat the store is being tried on some installations. While this has possibilities, I feel that the additional sheet metal, motorized dampers, motors, linkage and thermostats may possibly jeapordize the refrigeration system and in effect cause more trouble and added cost in maintenance than the savings we would be able to obtain by using slightly less fuel.

Roof Mounted Units

There are a number of unusual types of systems being used for supermarket heating and air conditioning. These include roof mounted combination heating and air conditioning units of various capacities. The complete package is mounted on the roof with supply and return air being distributed through a double duct with the combination supply and return type diffuser installed on the ceiling of the sales area. This type of system has an advantage for it is out of the store and takes no floor space. With the equipment on the roof, all service including filter cleaning must be done outdoors which is a disadvantage in inclement weather. Many architects object to any type of equipment on the roof of a modern supermarket. This is especially true in shopping centers. Also being used to a limited extent are gas driven engines in conjunction with reciprocating compressors, gas-fired absorption systems and the various types of chiller systems as well as electric heat pumps. At the present time this type of equipment is rather new and not too widely used; this tends to put the equipment somewhat out of line from the cost standpoint.

The basic idea of cooling and heating a supermarket is to obtain an efficient, economical system, keeping in mind at all times that standardization and simplification are important.

FLOW OF WATER IN CIRCULAR SEWERS

Continued from April. Table by J. Nachbar and associate, Albert Kahn Associated Architects and Engineers, Detroit, Mich.

Pipe ID, Inches	Slope of the Hydraulic Grade Line, Ft per Ft								Pipe ID, Inches
	.0018		.0019		.0020		.0021		
	V = Mean Flow Velocity, Ft per Sec, Q = Flow Capacity, Cu Ft per Sec								
	V	Q	V	Q	V	Q	V	Q	
4	.76	.07	.78	.07	.80	.07	.84	.07	4
5	.91	.12	.94	.13	.96	.13	1.01	.14	5
6	1.06	.21	1.09	.21	1.12	.22	1.17	.23	6
8	1.33	.46	1.37	.48	1.40	.49	1.47	.51	8
10	1.58	.86	1.63	.89	1.67	.91	1.76	.96	10
12	1.82	1.43	1.88	1.47	1.92	1.51	2.0	1.59	12
15	2.2	2.6	2.2	2.7	2.3	2.8	2.4	2.9	15
18	2.5	4.4	2.5	4.5	2.6	4.6	2.7	4.8	18
21	2.8	6.7	2.8	6.8	2.9	7.0	3.1	7.4	21
24	3.0	9.6	3.1	9.9	3.2	10.1	3.4	10.6	24
27	3.3	13.2	3.4	13.6	3.5	13.9	3.7	14.6	27
30	3.6	17.6	3.7	18.1	3.8	18.5	4.0	19.4	30
36	4.1	28.8	4.2	29.6	4.3	30.3	4.5	31.8	36
42	4.5	43.5	4.6	44.7	4.8	45.9	5.0	48.2	42
48	5.0	62	5.1	64	5.2	66	5.5	69	48
54	5.4	85	5.5	88	5.7	90	5.9	94	54
60	5.8	113	5.9	116	6.1	119	6.4	125	60
66	6.1	146	6.3	150	6.5	154	6.8	161	66
72	6.5	184	6.7	189	6.8	194	7.2	203	72
78	6.8	227	7.0	234	7.2	240	7.6	252	78
84	7.2	277	7.4	284	7.6	292	7.9	306	84
90	7.5	332	7.7	341	7.9	350	8.3	367	90
96	7.8	394	8.0	405	8.3	416	8.7	436	96

Pipe ID	Slope of the Hydraulic Grade Line, Ft per Ft								Pipe ID
	.0024		.0026		.0028		.0030		
	V	Q	V	Q	V	Q	V	Q	
4	.88	.08	.92	.08	.95	.08	.99	.09	4
5	1.06	.14	1.10	.15	1.14	.16	1.18	.16	5
6	1.23	.24	1.28	.25	1.33	.26	1.37	.27	6
8	1.54	.54	1.61	.56	1.67	.58	1.73	.60	8
10	1.83	1.00	1.91	1.04	1.98	1.08	2.0	1.12	10
12	2.1	1.66	2.2	1.73	2.3	1.79	2.4	1.86	12
15	2.5	3.1	2.6	3.2	2.7	3.3	2.8	3.4	15
18	2.9	5.1	3.0	5.3	3.1	5.5	3.2	5.7	18
21	3.2	7.7	3.3	8.0	3.5	8.3	3.6	8.6	21
24	3.5	11.1	3.7	11.6	3.8	12.0	3.9	12.4	24
27	3.8	15.3	4.0	15.9	4.1	16.5	4.3	17.1	27
30	4.1	20.3	4.3	21.2	4.5	22.0	4.6	22.7	30
36	4.7	33.2	4.9	34.6	5.1	35.9	5.3	37.2	36
42	5.2	50	5.4	52	5.7	54	5.8	56	42
48	5.7	72	6.0	75	6.2	78	6.4	81	48
54	6.2	99	6.5	103	6.7	107	6.9	110	54
60	6.7	131	6.9	136	7.2	141	7.4	146	60
66	7.1	169	7.4	175	7.7	181	7.9	189	66
72	7.5	212	7.8	221	8.1	230	8.4	238	72
78	7.9	263	8.2	273	8.5	284	8.8	294	78
84	8.3	320	8.6	333	9.0	345	9.3	358	84
90	8.7	384	9.0	400	9.4	415	9.7	429	90
96	9.0	455	9.4	474	9.8	492	10.1	509	96

FLOW OF WATER IN CIRCULAR SEWERS

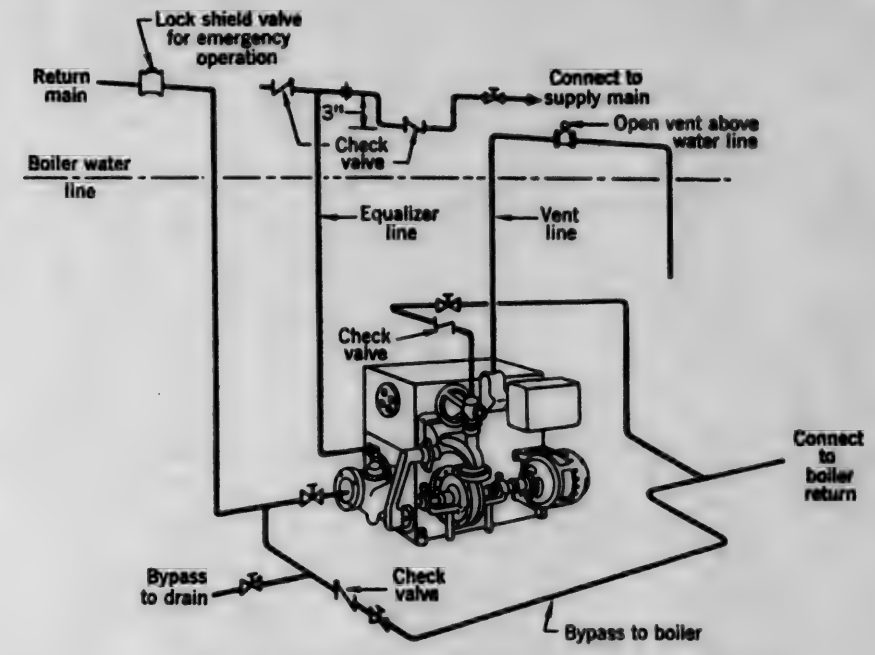
Pipe ID, Inches	Slope of the Hydraulic Grade Line, Ft per Ft								Pipe ID, Inches
	.0032		.0034		.0036		.0038		
	V = Mean Flow Velocity, Ft per Sec, Q = Flow Capacity, Cu Ft per Sec								
	V	Q	V	Q	V	Q	V	Q	
4	1.02	.09	1.05	.09	1.08	.09	1.11	.10	4
5	1.22	.17	1.26	.17	1.30	.18	1.34	.18	5
6	1.42	.28	1.46	.29	1.51	.30	1.55	.30	6
8	1.78	.62	1.84	.64	1.89	.66	1.95	.68	8
10	2.1	1.16	2.2	1.19	2.2	1.23	2.3	1.26	10
12	2.4	1.92	2.5	1.98	2.6	2.0	2.7	2.1	12
15	2.9	3.5	3.0	3.7	3.1	3.8	3.1	3.9	15
18	3.3	5.8	3.4	6.0	3.5	6.2	3.6	6.4	18
21	3.7	8.9	3.8	9.2	3.9	9.5	4.0	9.7	21
24	4.1	12.8	4.2	13.2	4.3	13.6	4.4	14.0	24
27	4.4	17.7	4.6	18.2	4.7	18.7	4.8	19.3	27
30	4.8	23.5	4.9	24.2	5.1	24.9	5.2	25.6	30
36	5.4	38.4	5.6	39.6	5.8	40.8	5.9	41.9	36
42	6.0	58	6.2	60	6.4	62	6.6	63	42
48	6.6	83	6.8	86	7.0	88	7.2	91	48
54	7.2	114	7.4	118	7.6	121	7.8	124	54
60	7.7	151	7.9	156	8.2	160	8.4	165	60
66	8.2	195	8.4	201	8.7	207	8.9	212	66
72	8.7	245	8.9	253	9.2	260	9.5	268	72
78	9.1	304	9.4	313	9.7	322	10.0	331	78
84	9.6	369	9.9	381	10.2	392	10.5	403	84
90	10.0	443	10.3	457	10.6	470	10.9	483	90
96	10.5	526	10.8	542	11.1	558	11.4	573	96

Pipe ID	Slope of the Hydraulic Grade Line, Ft per Ft								Pipe ID
	.0040		.0042		.0044		.0046		
	V	Q	V	Q	V	Q	V	Q	
4	1.14	.10	1.17	.10	1.20	.10	1.22	.11	4
5	1.37	.19	1.40	.19	1.44	.20	1.47	.20	5
6	1.59	.31	1.63	.32	1.67	.33	1.71	.34	6
8	2.0	.70	2.1	.72	2.1	.73	2.1	.75	8
10	2.4	1.30	2.4	1.33	2.5	1.36	2.5	1.39	10
12	2.7	2.1	2.8	2.2	2.9	2.3	2.9	2.3	12
15	3.2	4.0	3.3	4.1	3.4	4.2	3.5	4.3	15
18	3.7	6.5	3.8	6.7	3.9	6.9	4.0	7.0	18
21	4.1	10.0	4.2	10.2	4.4	10.5	4.4	10.7	21
24	4.6	14.4	4.7	14.7	4.8	15.1	4.9	15.4	24
27	5.0	19.8	5.1	20.2	5.2	20.7	5.3	21.2	27
30	5.4	26.3	5.5	26.9	5.6	27.6	5.7	28.2	30
36	6.1	43.0	6.2	44.1	6.4	45.1	6.5	46.1	36
42	6.8	65	6.9	67	7.1	68	7.3	70	42
48	7.4	93	7.6	95	7.8	98	7.9	100	48
54	8.0	128	8.2	131	8.4	134	8.6	137	54
60	8.6	169	8.8	173	9.0	177	9.2	181	60
66	9.2	218	9.4	223	9.6	228	9.8	234	66
72	9.7	275	9.9	281	10.2	288	10.4	294	72
78	10.2	340	10.5	348	10.7	356	11.0	364	78
84	10.7	413	11.0	423	11.3	433	11.5	443	84
90	11.2	496	11.5	508	11.8	520	12.0	532	90
96	11.7	588	12.0	602	12.3	617	12.6	631	96

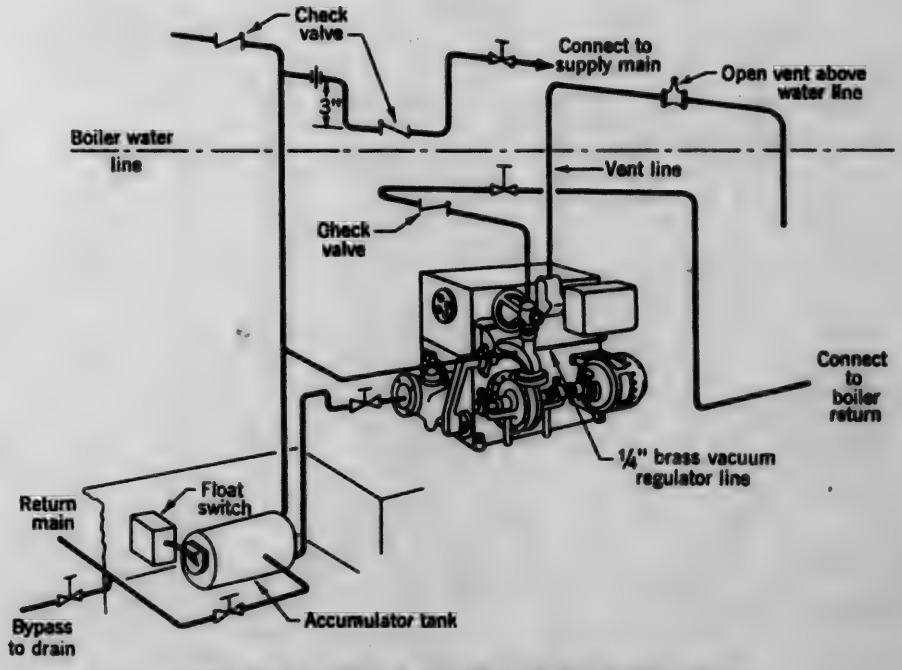
(The table is continued next month.)

STEAM HEATING SYSTEMS

Hookups for Return Line Vacuum Pumps



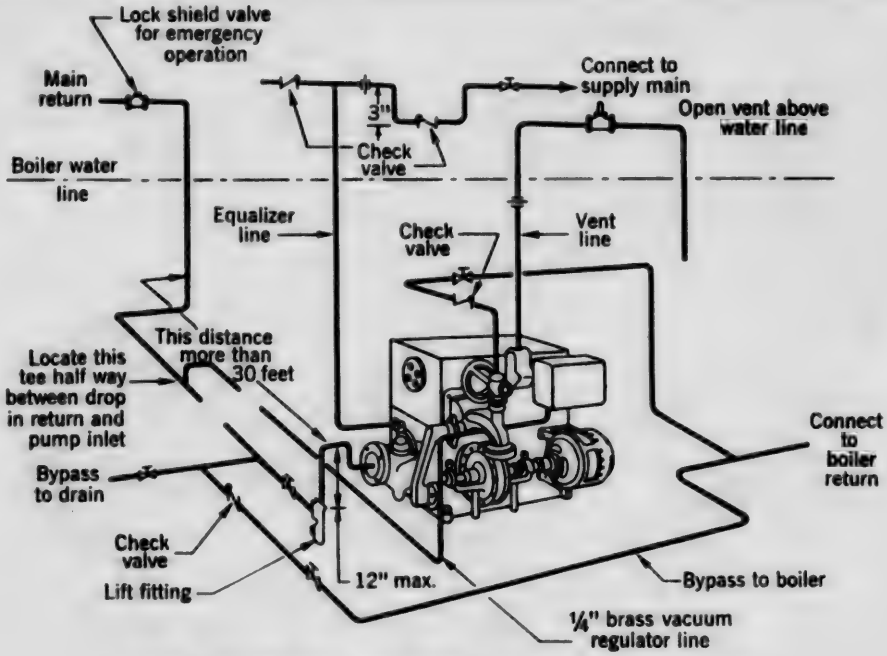
WHERE HEATING UNITS AND RETURNS ARE ABOVE THE WATER LINE OF BOILER, WITH GRAVITY BYPASS TO BOILER



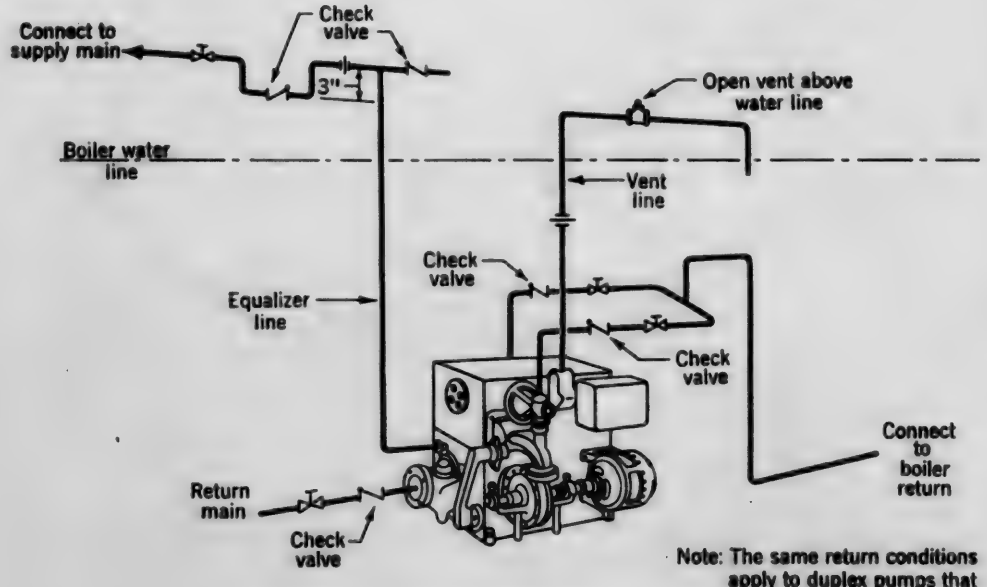
WHERE MAIN RETURN IS BELOW PUMP FLOOR LEVEL WITH CONNECTIONS TO HORIZONTAL ACCUMULATOR TANK

STEAM HEATING SYSTEMS

Hookups for Return Line Vacuum Pumps



WHERE HEATING UNITS ARE ABOVE THE WATER LINE OF BOILER AND THE RETURN EXTENDS ALONG THE FLOOR FOR OVER 30 FT.



Note: The same return conditions apply to duplex pumps that apply to single pumps.

CONNECTIONS TO BOILER FROM DUPLEX VACUUM PUMP

Drawings on This and Reverse Page, Courtesy of C. H. Wheeler Mfg. Co., Philadelphia, Pa.

CENTRIFUGAL FAN APPLICATION GUIDE: PART 2—

Is the System Correctly Designed?

C. J. TRICKLER
Chief Engineer, The New York Blower Company, Chicago, Ill.

In Part 2 of this five-part series, the author considers those effects of the system on the fan's operation, which, in turn, have an important bearing on the operation of the system. Failure to consider these effects are the more unfortunate when one discovers how few and basic are the principles that need be learned.

ANYONE designing a fan system must understand the effects the system has upon the fan before he has a right to expect either the fan or system to function properly.

Selecting the correct fan is half the job of making sure a fan system will function well. The other half of the job is in the design of the system itself.

By system is meant the path through which air is pushed and/or pulled. Since it may be any combination of ducts, coils, filters, etc., through which air flows, the system may be as simple as exhausting air through the wall of a building or as involved as a zoned dual duct air conditioning system.

Methods and calculations necessary to determine the resistance of a system are well known and described in many texts and manufacturers' literature. They will not be discussed here. The relation of system design to fan performance is seldom mentioned by these references, however.

Fan performance ratings are based on laboratory tests made under ideal conditions. Actual fan installations can be expected to deliver the fan's full rating only when the actual system allows the fan to operate as it would in a laboratory test. Any deviation will cause a change, invariably to the detriment of the system's performance in actual installations.

Fan rating tests are made under conditions that effectively eliminate the three most important causes of poor fan performance in the field. These are:

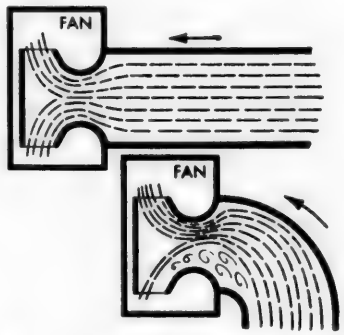


Fig. 1. Air load distribution at inlet to the fan.

(1) Eccentric flow into the fan inlet.

(2) Spinning flow into the fan inlet.

(3) Fan discharge ductwork that does not allow full development of fan pressure.

Where inlet connections are a part of the laboratory rating test, they are designed to provide uniform straight flow to the fan inlet. Outlet ducts are of the same area as the fan outlet and straight for at least ten diameters.

Is the Inlet Connection Adequate?

Air should be sucked into a fan inlet with the same velocity at all points in the inlet. This allows all portions of the fan wheel to do equal portions of the fan's work. If the air is caused to have a higher velocity through one part of the inlet, work is unevenly distributed, and the amount of work done will be diminished. This is represented in the lower illustration of Fig. 1, where an elbow on a fan inlet causes the air to load one side of the inlet. Total air flow would probably be reduced 5% to 10% below what it would be within even distribution, as in the upper illustration of Fig. 1.

Fans perform correctly when air flows straight into the inlet. The direction the air is flowing when it meets the fan wheel is quite important because the wheel works on the

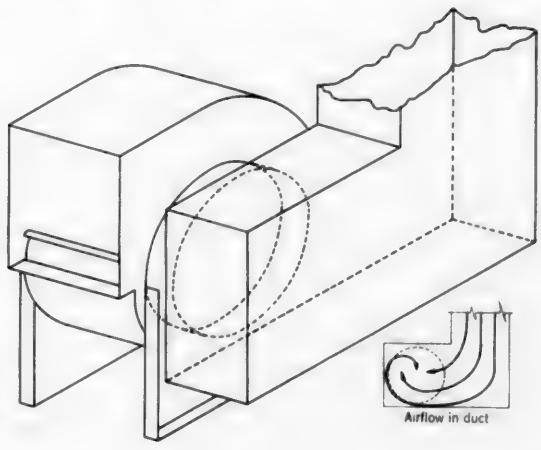


Fig. 2. Spinning caused by a poorly designed inlet box.

air by changing its direction and velocity. If air enters the fan inlet with a spinning (vortex) motion, capacity of the fan will be lowered.

Unintentional spinning flow into the inlet has the same effect on fan performance as does spinning intentionally produced by an inlet damper. A 30° spin will reduce air flow 15%, and a 45° spin, 25%. Spinning is often caused by inlet boxes, such as shown in Fig. 2. An ideal fan inlet connection creates neither eccentric nor spinning flow. Such inlet could be a long straight duct containing straightening vanes. However, it is usually necessary to adapt the system to the available space. When this is necessary, the system designer has a choice of either:

(1) Putting corrective devices in the duct to prevent eccentric flow, or

(2) Letting the eccentric and/or spinning flow go unchecked but compensating for them in selection of the fan.

The first choice is preferable, but the second is often necessary, particularly if the air is carrying material or the duct needs to be clear of obstructions for maintenance.

How to Avoid Eccentric Flow

When air makes a single-plane turn to get into the fan, eccentric flow is created. This can result from an elbow, such as in Fig. 1; an inlet box, as in Fig. 3 and 4; or in an inlet plenum, as in Fig. 5.

The detrimental effect upon the fan's performance is proportional to the degree of eccentricity. Table 1 lists common inlet connections producing eccentric flow, the percent drop in fan capacity to be expected for each, and the percentage increase in static pressure required to compensate for the eccentric flow in selecting the fan. For example: if it is necessary to use an inlet connection that will reduce fan capacity by 6%, the calculated system static pressure should be increased by the factor 1.13, where $1.13 = (1.00/0.94)^2$. If the system was calculated to have 3.00 inches SP at 10,000 cfm, the fan should be selected for $1.13 \times 3.00 = 3.39$ inches SP.

It is important to note that the higher pressure will not be observable on the system. The pressure increase is only for the purpose of selecting the fan. The fan will develop only the system static pressure, 3.00 inches in this case.

Table 1 also lists methods of reducing the effects of eccentric flow, both by turning vanes and by interposing straight duct sections between the fan and inlet turn. The values listed in Table 1 are the result of both laboratory tests and field experience.

How to Control Spinning Inlet Flow

Evaluating and controlling spinning inlet flow is more difficult than evaluation of eccentric flow because the types of connections that cause spinning are not so readily cataloged and because spinning usually occurs in combination with eccentric flow.

Spinning occurs principally from one of two reasons. Either air makes two consecutive turns in perpendicular planes that form a corkscrew path, or air is introduced to the duct or plenum tangentially. In either case it is the angle of the spin that is important in determining the effect on fan performance.

If the air spins in the same direction as the wheel is rotating, the net effect is similar to slowing down the fan. This is the same effect as is obtained with an inlet damper. Both capacity and horsepower are reduced. If air spins in a direction opposite to wheel rotation, the net effect is usually reduced fan capacity, and always increased horsepower.

Unlike the cases of eccentric

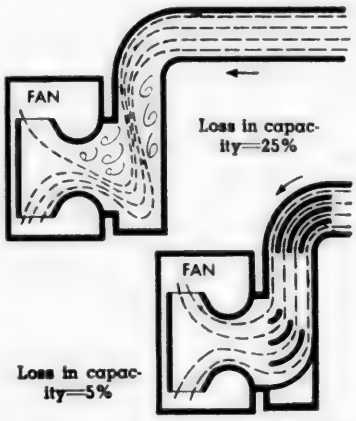


Fig. 4. Inlet box causing 25% loss due to eccentric flow, and use of vane to remedy the condition.

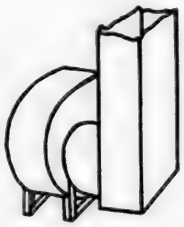


Fig. 3. Inlet box causing eccentric flow.

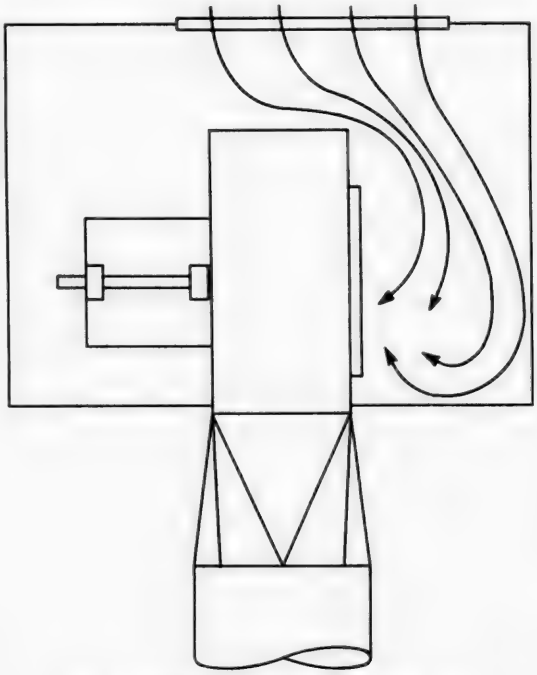
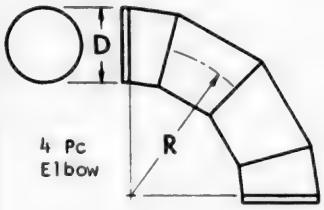
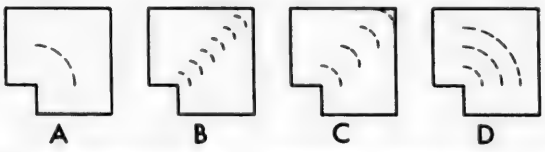
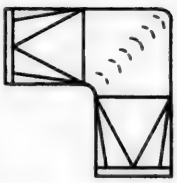
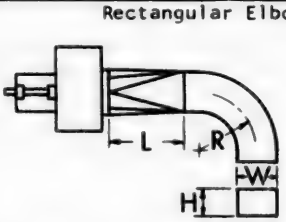
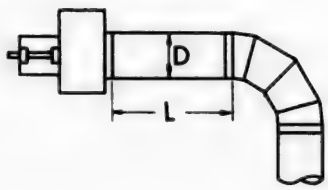


Fig. 5. Inlet plenum causing eccentric flow.

TABLE I—PROBABLE EFFECTS OF VARIOUS INLET CONNECTIONS

(These losses do not include friction losses)

DESCRIPTION		% LOSS IN CFM IF NOT CORRECTED	% INCREASE NEEDED IN FAN SP TO COMPENSATE
 3 piece elbow	R/D = .5	12	30
	1.0	6	13
	2.0	5	11
	6.0	5	11
4 piece elbow	R/D = 1.0	6	13
	2.0	4	9
	8.0	4	9
5 or more piece elbow	R/D = 1.0	5	11
	2.0	4	9
	8.0	4	9
Mitered elbow		16	42
Square Ducts with Vanes 	No Vanes	17	45
	A	8	18
	B	6	13
	C	5	11
	D	4	9
 Round to Square to Round		8	18
Rectangular Elbows without Vanes*  The maximum included angle of any element of the transition should never exceed 30". If it does, additional losses will occur. If angle is less than 30° and L is not longer than the fan inlet diameter, the effect of the transition may be ignored. If it is longer, it will be beneficial because elbow will be farther from the fan.	*In all cases use of 3 long, equally spaced vanes will reduce loss and needed sp increase to 1/3 the values for unvaned elbows.		
	$\frac{H}{W}$ = .25, & $\frac{R}{W}$ = .5	7	15
	1.0	4	9
	2.0	4	9
	$\frac{H}{W}$ = 1.00, & $\frac{R}{W}$ = .5	12	30
	1.0	5	11
	2.0	4	9
	$\frac{H}{W}$ = 4.00, & $\frac{R}{W}$ = .6	15	39
	1.0	8	18
	2.0	4	9



Each 2½ diameters of straight duct between fan and elbow or inlet box will reduce the adverse effect approximately 20%. For example, If an elbow that would cause a loss of 10% in CFM or an increase of 23% in fan SP, if on the fan inlet, is separated from the fan by straight duct the effect of the duct may be tabulated thus:

No duct . . . . . Loss = 10% - SP needed = 23%
L/D = 2½ . . . . . Loss = 8% - SP needed = 19%
5 . . . . . Loss = 6% - SP needed = 13%
7½ . . . . . Loss = 4% - SP needed = 9%
10 . . . . . Loss = 2% - SP needed = 4%

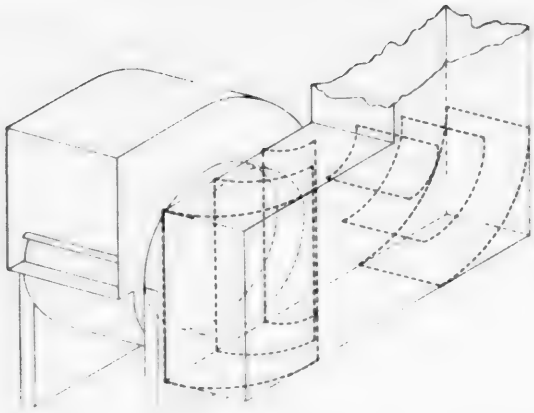


Fig. 6. Inlet box without vanes has loss of 40% of CFM; requires 180% extra SP selection to bring fan to desired capacity. With upstream vanes, loss is 17%; SP needs 45% increase. With both sets of vanes, loss is 11%; SP needs 25% increase.

flow, where acceptance of a bad condition is often necessary, it is a rare case where a system must be designed to create inlet spinning. Judicious use of simple turning vanes, egg-crate straighteners, and plenum designs can eliminate the occurrence of spinning. Fig. 6, 7, 8, and 9 show typical cases of inlet spinning, the loss in capacity that would probably be experienced, and methods of eliminating the spinning.

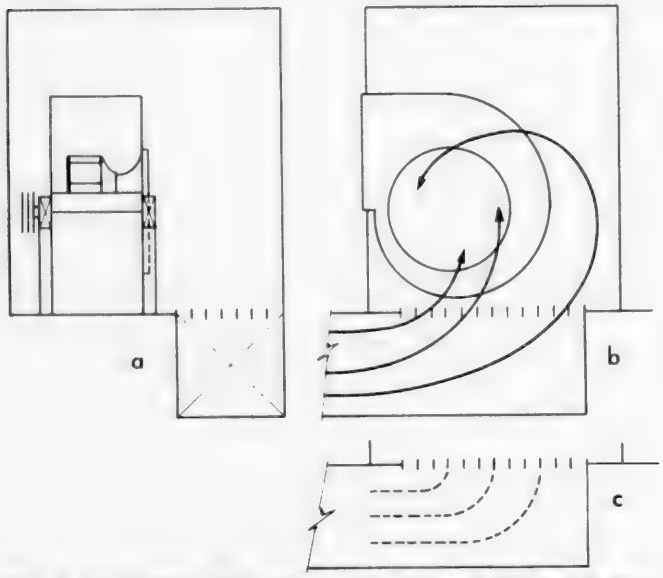


Fig. 7. In a and b, inlet plenum with air coming up through floor has unvaned loss of 20% of CFM; would require 56% increase in SP to compensate. Vaned duct in c would have much smaller loss; about 7%, requiring a 15% increase in SP selection.

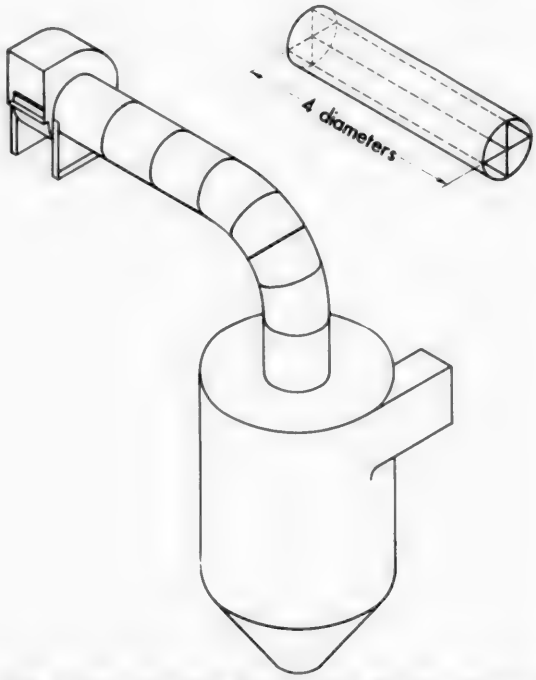


Fig. 8. Fan exhausting from cyclone. The loss depends upon the proportion of cyclone and could be as much as 40% of desired CFM. At upper right is simple remedy: an egg-crate straightener is put in the duct.

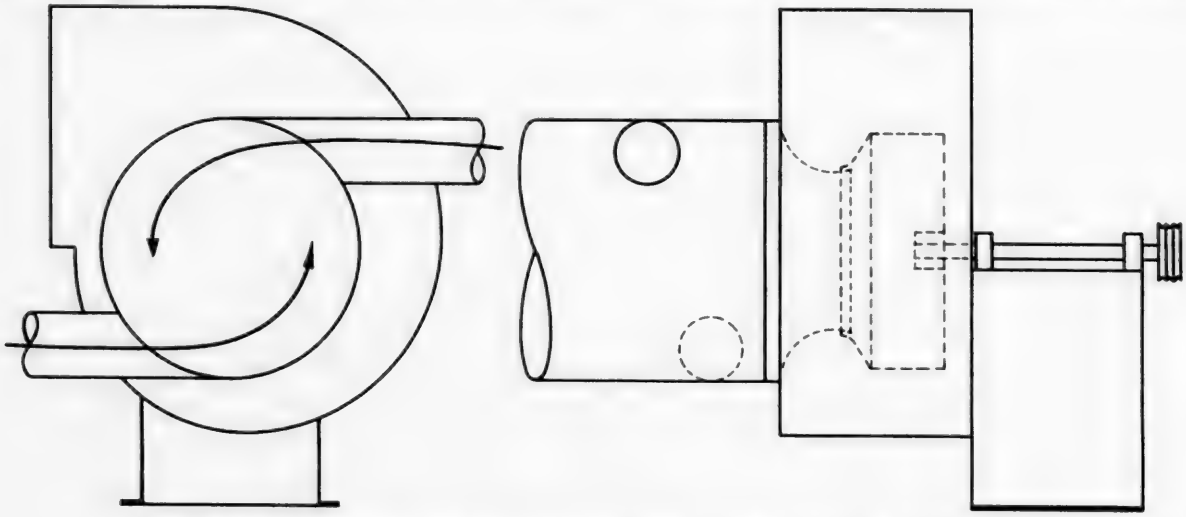


Fig. 9. Loss due to spinning air into the fan depends upon the amount of air introduced tangentially, and the angle at which it is introduced. This can be remedied by relocating ducts or by installing an egg-crate straightener at fan inlet.

Will the Outlet Connection Allow the Fan to Develop its Full Pressure?

The connection made to a fan's outlet cannot affect its performance as much as can the inlet connection, as the fan has done its work on the air by the time it reaches the outlet. However, the discharge connection does affect fan performance, and its design is important.

Air is not discharged from a fan with uniform velocity across the fan outlet. This is because the air has weight and is thrown to the outside of the scroll. Fig. 10 shows a typical velocity pattern at a fan discharge and several duct diameters down a straight duct, where the velocity has become substantially uniform.

The law of continuity dictates that, in a duct of uniform cross-section, average velocity will be the same at all points along the duct. However, where velocity distribution changes, the summation of velocities at each point along the duct is not necessarily the same. Since velocity pressure is proportional to velocity squared, the summation of velocity pressures at the fan discharge is higher than the same summation performed several diameters down the duct. Since total pressure is the same at both points, neglecting the small friction drop, the static pressure should be higher down the duct than at the fan. Tests bear this out.

If the discharge duct is omitted, a loss equal to roughly half the average fan outlet velocity pressure occurs, and a system resistance calculation should include this pressure loss as additional required static pressure.

If the fan discharges into an expanding transition, such as is common where coils are placed at the fan discharge (See Fig. 11) the loss will depend upon the angle of the transition. An included angle of 30 degrees would cause a loss of about one-fourth the fan outlet velocity pressure.

Outlet connections shown in Fig. 12(a) and 12(b) are poor. Imagine the path of the high velocity air leaving the fan scroll. A connection of this type should be considered to have a loss equivalent to its entire fan outlet velocity pressure.

Static regain at fan outlets is often wastefully overlooked, especially when the fan is discharging to the atmosphere. Figure 13 shows three fans that could be at the end of exhaust systems. If each fan system calls for 3 inches of static pressure up to the fan inlet and a fan outlet velocity of 3,000 fpm (velocity pressure of $(3000/4000)^2 = 0.56$ inches) the fan without duct should be selected for 3.28 inches SP; the fan with several feet of straight duct for 3.10 inches; and the fan with the tapered discharge duct that reduces velocity to 1000 fpm for 2.55 inches.

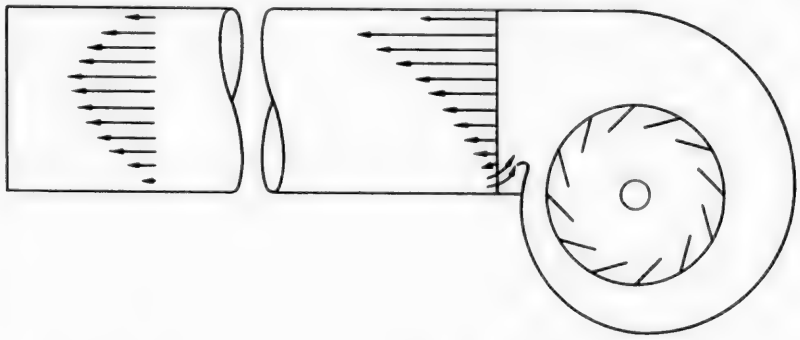


Fig. 10. (above) Air velocity pattern several diameters down a straight duct.

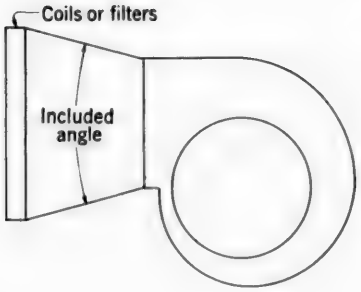


Fig. 11. (left) Fan with expanding outlet connection. Included angle should not exceed 30 degrees.

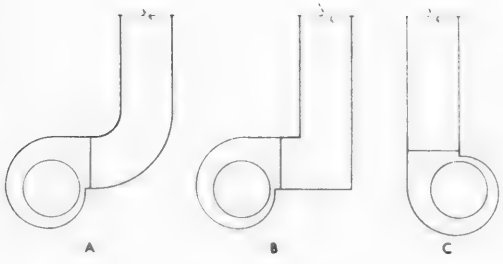


Fig. 12. Installations, as in A and B, though often seen, result in a loss equal to the fan outlet velocity pressure. Arrangement C is good.

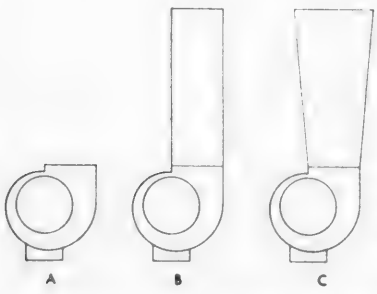


Fig. 13. If each fan is to have a 3-inch inlet pressure and have an average outlet velocity of 3000 fpm, equivalent to 0.56-inch VP, Fan A should be selected for 3.00 plus ½ VP, or 3.28 inches; Fan B should be selected for 3.00 plus 0.1 friction, or 3.10 inches; and Fan C should be selected for 3.00 plus 0.05 friction less a static regain of 0.56 minus 0.06, or 2.55 inches.

Conclusion

Failure to consider the effects the system will have on the fan's performance can have serious effects on the operation of the system. The principles involved are simple and should be used consistently.

(Part 3 follows next month)

Water for Heat Pump Pre-Conditions Ventilation Air; One Well Serves in Winter, a Deeper One in Summer

A. W. KRAUSE
Engineer, Long Island Lighting Company
Mineola, New York

USE OF WELL WATER from two different depths for preheating and precooling ventilation air before its use in condenser or evaporator is an unusual feature of a heat pump installation at Long Island Lighting Company's new Brentwood Operations Center, Brentwood, L. I., N. Y. The system serves a two-story office building with basement and total floor area of about 65,000 sq ft.

The system is expected to provide the Btu equivalent of three watts in heat output for every watt of electrical energy supplied. The accompanying full-page flow diagrams illustrate water and refrigerant flows for winter and summer cycles.

Well water serves as a heat source in winter, as a heat sink in summer. It passes through the system once, then is returned to the ground through a diffusion well. Both well pumps have a rating of 400 gpm at a discharge pressure of 85 psig. The deeper well at 136 ft is used in summer, the shallow well at 91 ft depth is used in winter. This dual well application is expected to provide increased thermal efficiency since the deeper well is expected to be somewhat colder. In addition, each pump serves as a standby for the other.

The same type of heat transfer is involved for heating and cooling; that is, heat is transmitted between or from well water to refrigerant, to circulating water and then to room air. In both summer and winter the water chiller (evaporator) serves as a water cooler and the condenser as a water heater; alternately the water chiller (evaporator) vaporizes and adds heat to the refrigerant and the condenser condenses and cools the refrigerant.

In winter, well water is used initially to preheat fresh air. Thereafter, it heats and vaporizes the refrigerant at the water chiller (evaporator). The circulating water in turn is heated by the hot refrigerant gas at the condenser. (Follow heavy lines in illustration, right.)

In summer, well water is used initially to precool mixed fresh and return air. Thereafter, the well water cools and condenses the refrigerant gas at the condenser. The circulating water in turn is cooled by the refrigerant gas at the water chiller (evaporator).

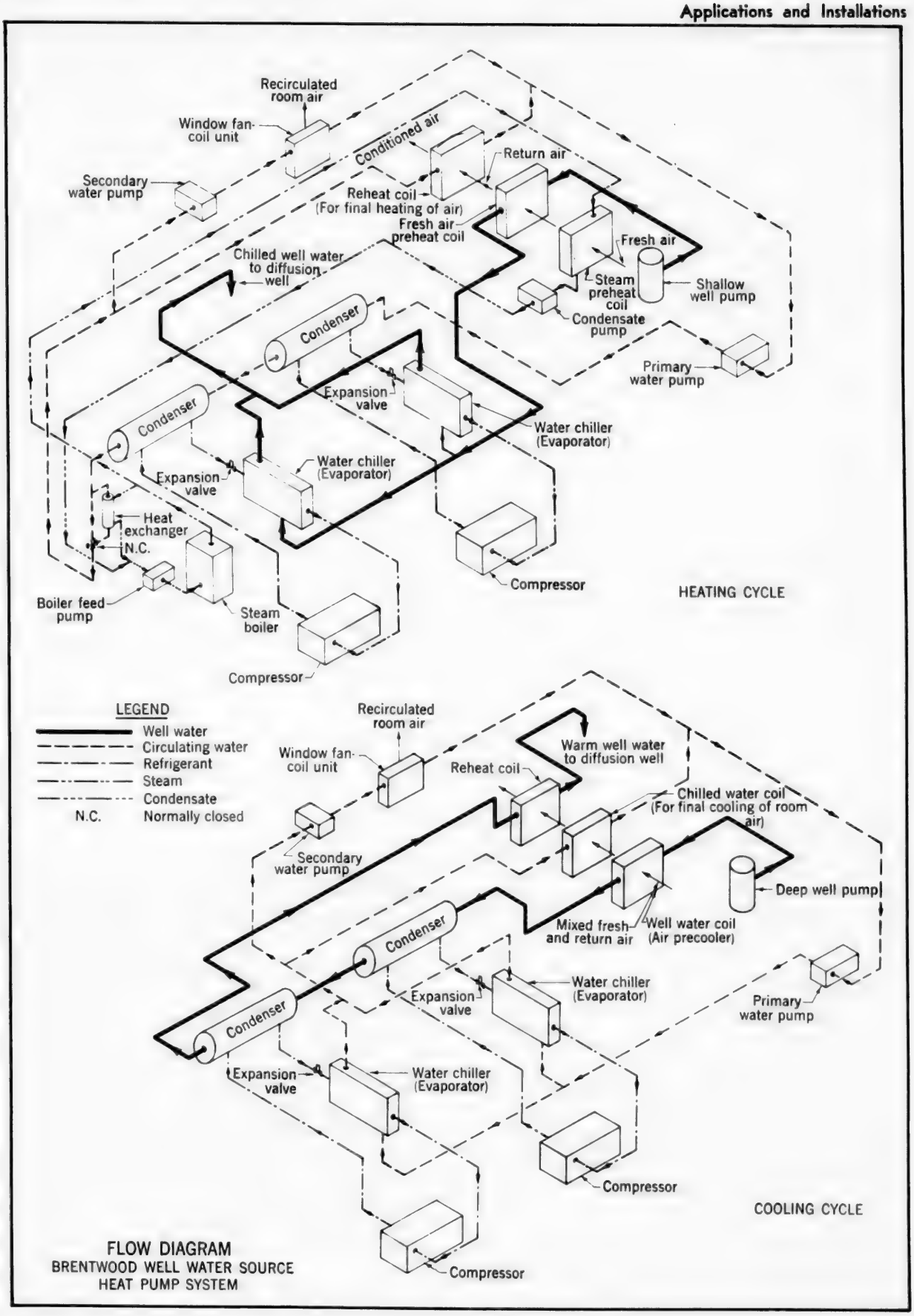
Refrigerant-12 and circulating water flow in separate closed systems. The refrigerant does not change its direction of flow for summer and winter operation; at all times it passes in sequence through compressor, condenser, and water chiller. Both well water and circulating water do change their path of flow through condenser and water chiller for summer and winter, but do not reverse their direction of flow. The circulating water passes through water chiller to be cooled in summer and through the condenser to be heated in winter. Alternately the well water passes through condenser in summer and through water chiller in winter.

In general, the controls for the heat pumps and air conditioning systems are fully automatic. A manual changeover switch, however, is used for selecting winter and summer cycle. Operation of this switch positions valves for proper water flow. Thermostats at condenser and chiller outlet maintain circulating water temperature for heating and cooling respectively by controlling the capacity of the compressors through a step controller.

A steam boiler is included to provide 140–180 deg F domestic hot water since the heat pump provides only 110 deg water. The boiler is piped, however, so that steam can be used in an emergency to provide some heat to the circulating water through a heat exchanger. (During building construction, the boiler was used for this purpose.) The boiler also can provide steam to an initial fresh air preheat coil, providing freeze-up protection for the coil.

System Capacity Versus Requirements

The Brentwood Office Building was designed for outside air conditions of —10 deg in winter, and 95 deg db



FLOW DIAGRAM
BRENTWOOD WELL WATER SOURCE
HEAT PUMP SYSTEM

and 75 deg wb in summer. Design inside conditions are 75 deg in winter, and 75 deg db, 50% rh in summer. Under these conditions, maximum heating load is about 3,580,000 Btu per hr, maximum summer cooling load about 2,955,000 Btu per hr.

Estimated maximum heating and cooling capacity is given below:

Heating Capability

First heat pump	1,000,000 Btu per hr
Second heat pump	1,000,000
Well water preheat coil	1,080,000
Heat gain from lights	873,000
	3,953,000 Btu per hr

Cooling Capability

Heat pumps	1,200,000 Btu per hr
Well water precooling coils	1,790,000
	2,990,000 Btu per hr = 250 tons

Air Handling Systems

There are five air supply systems and seven temperature control zones. The primary exterior system discharges air through overhead diffusers. This equipment, in conjunction with fan-coil units beneath windows, is designed to take care of heating and cooling requirements within 15 ft from exterior walls. Requirements beyond this distance are taken care of mainly by the general interior system.

In general, each air handling unit (other than basement ventilation) includes in sequence an automatic oil filter, spray nozzles for humidity control, well water coil, chilled water coil and reheat coils. The basement ventilation air system is cooled only by well water coils and not designed for complete air conditioning. This system supplies a portion of the space in the basement which is occupied only part of the day, by field service men.

Well Water Treatment

Well water at Brentwood is acidic and has a pH of about 6.0. Liquid caustic soda is used in small quantities to neutralize it and thereby minimize corrosion and increase life of piping and other equipment.

Heat Pump Performance

Equipment has been installed to measure power consumption and demand as well as heating and cooling thermal output. Thermal efficiency, operating costs, and load characteristics may be determined thereby. Counters were installed to measure the number of stops and starts for both compressors. Performance and cost data will be reported in a future article.

Equipment Design and Installation

The overall Brentwood Operations Center, including the heating/cooling systems, was designed by Francisco and Jacobus, Engineer and Architect, New York City, in conjunction with the Long Island Lighting Company Engineering Department. The mechanical contractor for the heating, ventilating and air conditioning system was James H. Martin, Inc., also of New York City. York water chillers and Minneapolis-Honeywell controls were used in the heat pump system.

Power Piping Welded in Place With Aid of Air Balloons

To match an increasing demand for electric power in the Cleveland area, Cleveland Electric Illuminating Co. decided to expand its Avon Lake power plant. Part of the job comprised making 154 field welds in stainless steel main steam and reheat piping. All of these welds had to pass radiographic examination, and the welds in the main steam piping required a hydrostatic test of 5970 psi.

Piping contractor, Pittsburgh Piping and Equipment Co., Pittsburgh, used the Heliarc welding process, and put eight Linde HW-17 torches on welding the smaller, 6- and 7-inch dia pipe, and two Linde HW-18 torches on the 20-inch dia hot reheat piping.

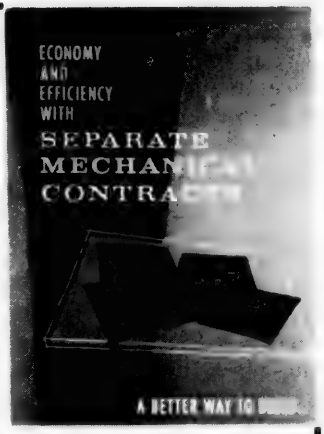
To give inert-gas shielding to both sides of the weld, two air balloons were inflated inside the pipe, one on either side of the joint. Argon was then pumped in through a small hole in the pipe between the balloons to displace the air and protect the weld from contamination. The balloons inflated tightly against the pipe inner wall, blocking the gas flow and keeping argon cost to a minimum.

Welding was performed as a straight fusion method, without addition of filler rod. The consumable insert ring fuses between abutting pipe sections, providing a tight joint. Upon completion, the welds were ground smooth and a radioactive iridium pill was placed inside the pipe, using a small inspection hole and a hinged

rod to hold the pill. The X-ray film was then wrapped around the outside of the joint for exposure.

Single Contracts versus Separate Mechanical Contracts

Where Do Engineers Stand?



The National Association of Plumbing Contractors has taken a stand for the complete separation of mechanical bids from the remainder of construction contracts on both public and private works.

A 20-page brochure, "Economy and Efficiency with Separate Mechanical Contracts," prepared by NAPC's Technical Department, is aimed at convincing architects, engineers, school boards, and other building owners that it is more economical to separate the mechanical sections of a construction contract in order to have these sections bid upon by competent mechanical contractors. The sections indicated for separation are those traditionally listed as mechanical—plumbing, heating, ventilating, electrical air conditioning, refrigeration.

Included in the booklet is a chart of some dozen actual construction projects where the bids were taken two ways—on a single contract basis and on a separate contract basis. The costs to the owners were lower on the separate mechanical contract basis by an average of 7½%.

The booklet lists benefits which the owner obtains to be exclusive choice of contractors, better cost analysis, firmer control, lower costs, tighter responsibility, and better advice and service.

Reported advantages of the separate mechanical contract system to architects and engineers include fewer job headaches, competent advice on plans and specifications, and smooth running on-site work procedure. The brochure points out that the general contractor can benefit under the separate contract system by being relieved of the harassment and inconvenience of incompetent mechanical sub-contractors on the job.

Initial distribution of the book by NAPC includes a mailing to all registered architects, all members of the Consulting Engineers' Council, state and federal purchasing agencies, all members of Congress, and other mechanical contracting organizations. Additional copies are available, for 15 cents, from NAPC, 1016 20th St., N.W., Washington 6, D.C.

ACH&V editors conducted an informal survey among engineering acquaintances and found opinions on this subject falling generally into two groups. One group strongly favored separate mechanical contracts; the other leaned toward the single contract method although some in this group indicated conditions under which separate mechanical contracts might be preferred.

Separate Contracts

Some engineers went along whole-heartedly with the advantages listed in the NAPC booklet for separate mechanical contracts. Here are some comments:

"My own opinion is that we should have individual contracts and the prime reason for this is that bid shopping is eliminated. With the single contract, the general contractor, after receiving the contract, at times will attempt to reduce the bids of his subs down to the last dollar, to his own benefit and to the detriment of the owner and the job. The architect and consulting engineer usually wind up with a poorer class of sub-contractors and have double work and responsibility."

Some states now require separate mechanical contracts on public work. However, regarding private jobs where separate contracts are not required, this engineer goes on to say:

"An excellent solution is that used by the construction division of the Archdiocese of New York (Roman Catholic). Individual bids on all phases of the work are received by the man in charge of contractural work. Contracts are awarded to responsible contractors, then these contractors are *assigned* to the general contractor. From this time on, the general contractor is responsible for all coordination, and for this he receives an extra fee. The system has worked very well and the bid shopping, with resultant evils, is eliminated."

(A phone call revealed that while this system was used a few years ago, the Archdiocese now leans more closely to the single contract method, but attempt is made to incorporate safeguards against abuses. For example, when a major job is about to start, the general contractors on the bid list are asked to submit names of mechanical sub-contractors from which is compiled a pre-qualified, selected bid list. When the time comes for the formal invitation to bid, the instructions to bidders stipulate that only from the names on the "qualified" sub-contractor list can bids be solicited. This is reported to give the general contractor the buying power that he wants to have, and also to cover some of the loose ends that have previously been encountered, such as temporary light and power, temporary heat, digging of trenches for utilities, etc. It also protects the mechanical sub-contractor in that he knows who his competition is and he doesn't

have to worry about some unqualified bidder coming in and taking the job away.)

Single Contracts

Some engineers unequivocally favored the single contract system. One spokesman said:

"The general contractor is still the most qualified person to handle and control all of the many phases of building construction, including the mechanical trades. If separate bids are resorted to, the architect and engineer inherit the contractor's job of coordinating the work of the many sub-contractors. The work of the mechanical trades should not be broken down into separate contracts any more than painting, plastering, etc., should be bidded directly to the owner.

"The mechanical sub-contractors are themselves to blame for allowing the after-bid price cutting, bid-shopping practice to exist. It would be better if they would straighten out these practices within their own trades, rather than to try to by-pass the general contractor who has been traditionally trained in the complicated work of supervising the many sub-contractors who put the building together."

Other engineers, while seeing good points in separate mechanical contracts, for reasons of practicality and expediency tended to prefer the single contract method. However, they enumerated conditions under which they might favor separate mechanical contracts. These comments are typical of this group:

"Generally our work goes out with the general contractor responsible for all phases of the work. We have found this very satisfactory as one person has full responsibility for the complete job. This is particularly important in alteration work where there has to be close supervision and coordination of all trades. This method usually costs the owner more, but it eliminates a lot of wear and tear on all concerned. Incidentally, we reserve the right to approve or disapprove the general contractor's sub-contractors.

"However, quite a few of our jobs are handled on the separate contract basis to keep the cost down, with this office receiving an extra fee for the extra work involved. The extra work comprises dealing with four or five prime contractors rather than one; keeping after the various contractors to get their work done in time and in a manner so as not to hold up other trades; straightening out job disputes as to responsibility, damage to work, etc.; and additional time required for job meetings.

"Summing up, I would say that the general contractor set-up is to be preferred over the separate mechanical contract unless the architect and/or engineer has control over the selection of contractors and receives an additional fee for the extra work involved."

Where do engineers stand? It would seem from the foregoing that the question of separate mechanical contracts holds many more ramifications for the consulting engineer than it does for the mechanical contractor. While the engineers do seem to agree in principal on the worth of separate mechanical contracts, actual working conditions appear, at present, to have dictated a split-decision.

Cooling Tower Preservation with Non-Oxidizing Chemicals

Non-oxidizing chemicals have superior properties in cooling tower protection and control of algae and slime, according to a report, recently announced by The Dow Chemical Company, on a 15-year cooling tower performance study.

The report was prepared by C. D. Carlson of Dow's Texas Division at Freeport. The performance check covered 15-years of cooling tower experience and highlighted data on specialized programs initiated in 1949 and 1958.

In a summary of the 10-page findings, this was the general conclusion:

"From the results of the cooling tower treating experience at Freeport, it is obvious that non-oxidizing chemicals such as sodium pentachlorophenate or commercial formulations containing blended chlorophenates as the main ingredients are superior to all other methods tried in the past, including chlorine."

The treatment records were compiled on a cooling tower serving a styrene plant in Freeport. The tower is in three units which have a common settling basin and actually operate as a single unit.

The system serves the styrene plant heat exchangers and contains a total of approximately 2,000,000 gallons of water with a daily circulation of 100,000,000 gallons and an average water make-up of 1,700,000 gallons per day.

When the tower was first put into operation in 1943, chlorine was used for biological control. However, algae control was difficult and mist eliminators required hand cleaning at least once a year. "Chemical white deterioration" (delignification) also proved a problem. Characterized by softened wood with a bleached appearance, the condition is thought due to chlorolignin formation. When alkalinity is high and excessive amounts of chlorine are used, the chlorine can react with the lignin in the wood and the wood quickly deteriorates due to separation of the cellulose fibers. The study indicated that even a low concentration of chlorine can initiate surface deterioration of wood.

The second phase of the study was initiated in 1948 when the entire cooling system was cleaned and sodium pentachlorophenate was circulated at 80 ppm. Within 24 hours after start of treatment, all signs of algae disappeared where direct water contact was made, the study showed.

Listed as main advantages of sodium pentachlorophenate over chlorine were:

1. A lower net cost.
2. A more thorough job.
3. Actual surface protection for wood was contrasted with the delignification hazard of chlorine.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Piping Sleeves

ONE very important consideration for piping systems, which seldom receives more than a mention in the specifications, is piping sleeves. Although these sleeves have many applications in a building, their use is most often left to the judgment of the contractor.

Each type sleeve available is needed for different applications in the building; and the function of some of the types will be discussed.

Typical Installation

Figure 1 represents a riser diagram of a plumbing system in a building. The system is comprised of soil, waste, vent and storm water leader lines. The locations where sleeves are used is denoted on the riser diagram by means of the symbol given. For the leader lines, a sleeve is shown at each floor level. This is necessary because the leader lines are generally run independently of other services and therefore a hole must be provided in the floor slabs for its passage.

Sleeves are also used at the top of soil and waste stacks for the passage of the vent terminal above the roof level. Sleeves were not shown at each floor level for the soil and waste stacks since a slot is usually provided in the floor slab for the passage of this piping, including the water piping.

Piping sleeves are important factors for the different piping systems that pass through the foundation wall. Here the sleeves must ensure a watertight installation. Sleeves are also needed for various reasons at the lower floor level in the building, including the sump pump pit.

Foundation Wall

Building sewer, storm water, sprinkler, standpipe and gas lines are some of the service facilities or systems that must pass through the foundation wall. Figure 2 shows a building sewer passing through this wall. Although several different types of piping sleeves can be used for this application, a type that is fabricated on the job site is shown, for example. This sleeve is fabricated and set in the forms for the pouring of the concrete foundation wall. The piping is then installed and the void between the piping and the sleeve filled with caulking compound to offer a watertight connection.

For any line passing through a foundation wall, there is always the danger of water forcing its way around the service or sewer line and eventually seeping into the building. This not only creates a nuisance problem but is also extremely difficult to correct. Normally when this situation occurs it is necessary to chip away some of the concrete around the piping at the interior of the building and fill with cement plaster. In a short period of time, the water will again force entry and the sleeve must be

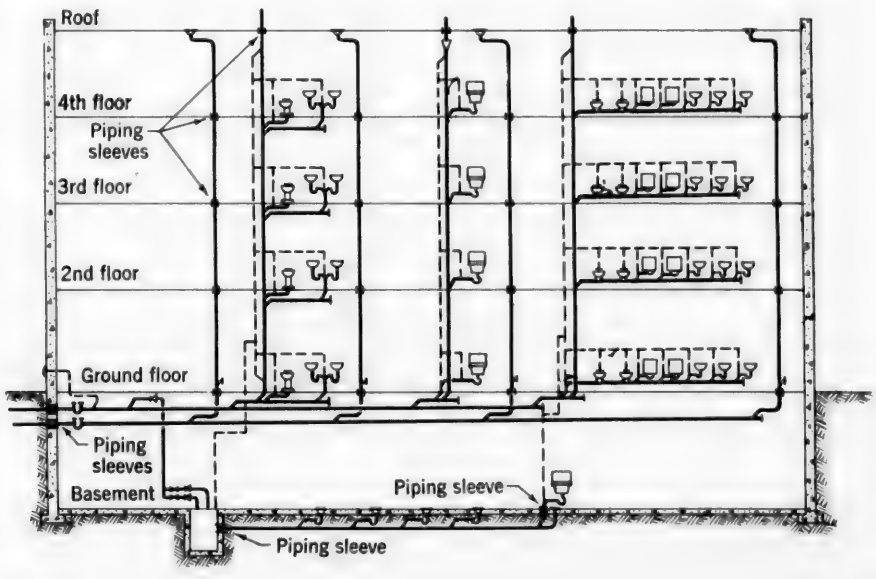


Fig. 1. Locations in piping systems where piping sleeves are used.

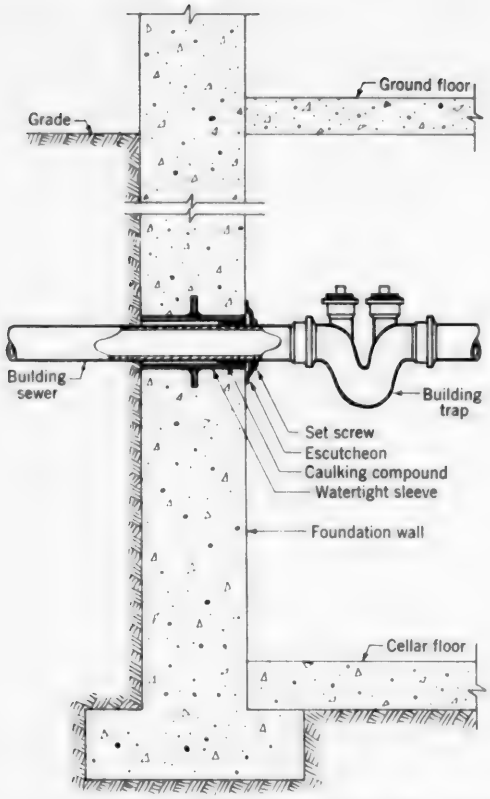


Fig. 2. A typical application of a watertight sleeve for installation to bring the building sewer line through the foundation wall.

repaired again. The only correct solution can be accomplished during the construction stages when a watertight sleeve is installed to definitely avoid the moisture condition more permanently.

Watertight Sleeves

Several types of watertight sleeves are available to provide a watertight connection for piping that passes through the foundation wall. Three such sleeves are illustrated in Fig. 3.

Fabricated Type Sleeve. This is one that is made at the job site. The contractor cuts a piece of pipe to the proper length of sufficient diameter to permit passage of the line or service with which it is to be used. Steel piping is generally used for this purpose although certain other materials can be used with equal success. A hole is burned in a disk of steel and it is slipped over the sleeve and welded in place. This flange serves as an anchor for the sleeve in the concrete, in addition, to preventing moisture from forcing its way around the sleeve.

The sleeve is then placed in the forms for the pouring of the foundation wall. After the service or sewer line is installed, the void between the sleeve and the line is filled with caulking compound to ensure a tight seal. An escutcheon placed on the line in advance is then slid into position against the wall and its set screw tightened to secure it in place. Eventually, when the caulking fails and the water seeps through, it is an easy matter to recaulk the void and maintain watertightness at the sleeve.

Double Hub Sleeve. This is a manufactured device that is very practical for watertight applications. It is made of cast iron and may be obtained in any prescribed length. It includes a hub at each end and is also equipped with a flange at its center.

The sleeve is set in the forms before the foundation wall is poured. After the service or drainage lines are installed, the hubs are packed with oakum and then caulked with lead. An escutcheon at the interior wall offers a neat appearance. Should moisture seep through at the inner hub, a watertight seal can be accomplished, merely by recaulking the lead with a caulking tool.

Single Hub Sleeve. This, too, is a manufactured cast iron device with the exception that it includes only one hub connection. The sleeve is of a given length but it is equipped with cut-off rings to allow the contractor to fit the unit to the proposed thickness of the foundation wall. The cut-off segments are easily removed with a hammer and chisel to fit a desired length.

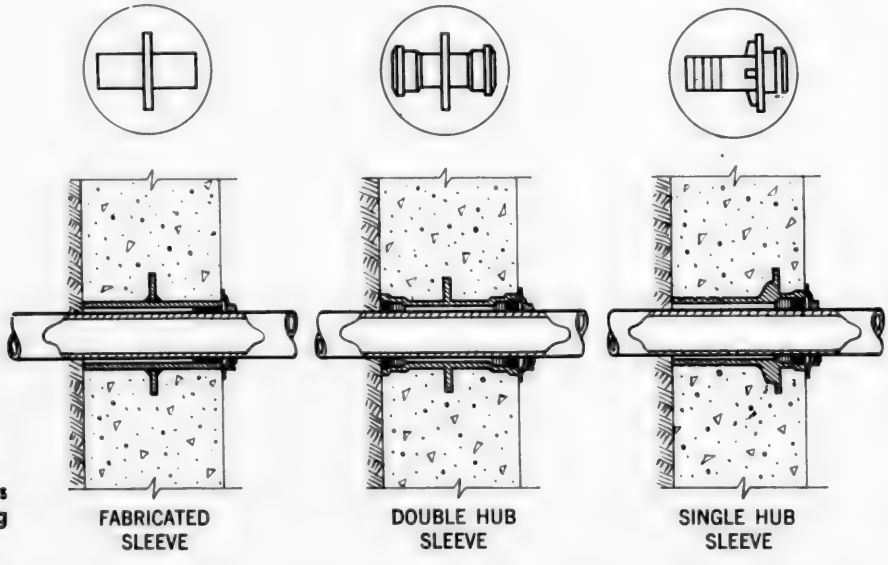


Fig. 3. Types of watertight sleeves that may be used for piping through a foundation wall.

The unit is placed in the forms before pouring the foundation wall. After the service or drainage lines are installed, the hub is packed with oakum and caulked with lead to provide a watertight sleeve. The escutcheon here again presents a neat appearance at the interior of the building. The exact location of the proposed sleeves in the foundation wall is a detail that must be carefully handled between the plumbing contractor and the foundation contractor. Many engineers will provide a sleeve drawing to be assured that the locations are exact.

There are other types of sleeves an engineer may favor. Those illustrated are merely for example.

Sump Pumps

In this application, Fig. 4, a watertight sleeve is used for the line entering the sump pit. The watertight sleeve in the illustration is only for the purpose of example. It is very important that a watertight connection be afforded at the sump pit to prevent seepage at this point.

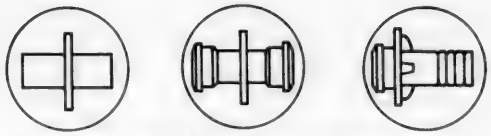
This type of application can also be extended to sewage ejectors and other underground pits or tanks of all description, that are constructed of concrete and must contain water or waste liquid. For the example shown, any of the sleeves shown in the inserts may be used with equal success.

Leakage at connections in underground pits or tanks can be contaminating; therefore, every precaution should be taken to provide a watertight connection. An underground water tank can be contaminated by a ground water source when a leaking connection exists. A leaking connection at a sewage ejector can contaminate the ground.

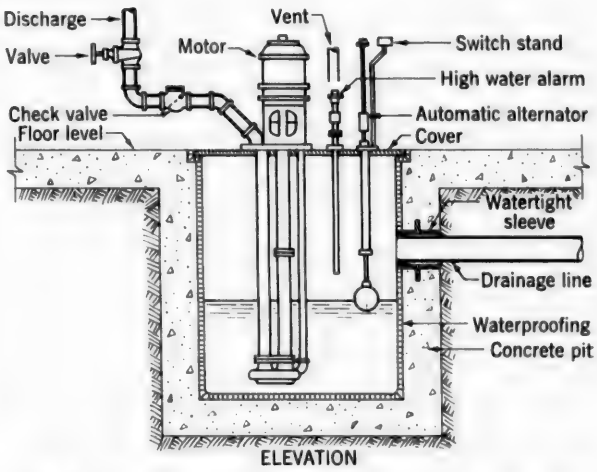
Basement Floor

When soil, waste or leader lines pass through lower floor slabs, adequate measure must be taken concerning sleeves. Two methods that are very practical are shown in Fig. 5.

At *A* is a fabricated type sleeve that is slid over the piping during installation. Later, when the floor slab is to be poured, the sleeve is set at the proper elevation on the piping. After the floor slab is poured, the void between the sleeve and the piping is filled with caulking compound to provide a watertight seal. The seal in this case not only guards against moisture conditions but also thwarts the entry of vermin.



VARIOUS WATERTIGHT SLEEVES
THAT MAY BE USED FOR THIS APPLICATION



ELEVATION

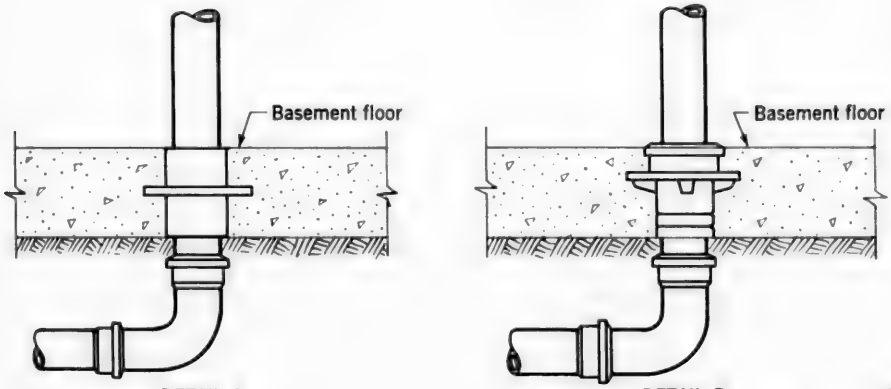
Fig. 4. How a watertight sleeve can be used at a sump pit for drainage and for passing a pipe line through the pit wall.

Detail *B* shows a sleeve with a single hub. This sleeve is also placed on the piping during its installation and is then positioned at the proper elevation for the pouring of the concrete slab. Later, the hub is packed with oakum and is then caulked with lead to gain a watertight sleeve. Other methods favored by the engineer may be utilized with equal success.

Watertight Floor Slabs

When ground water conditions prevail at the site, the floor slab must be waterproofed in a manner that will prevent seepage through the slab. How this may be done is shown in Fig. 6.

The floor slab in this case is comprised of a rough slab, a layer of waterproofing material, and a finished floor. The sleeve is slipped over the piping during its



DETAIL A
Fabricated type
watertight sleeve

DETAIL B
Manufactured type
watertight sleeve

Fig. 5. Use of sleeves for making a watertight joint where pipe passes through a lower floor slab.

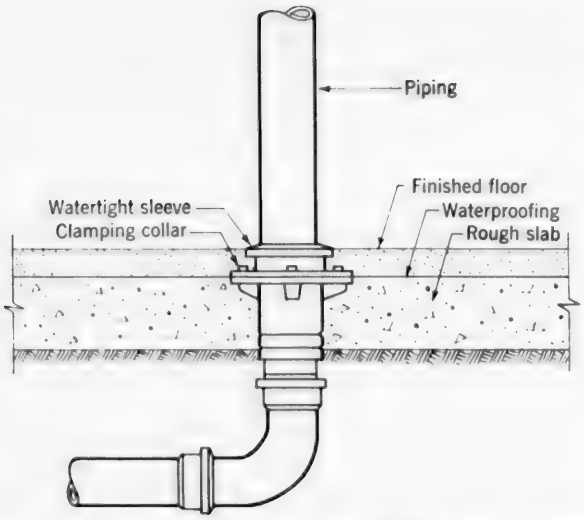


Fig. 6. Another type watertight sleeve used when a pipe line passes through a floor slab.

installation and is then carefully positioned for the pouring of the rough floor slab. The flange of the sleeve is so placed that it will be level with the rough slab.

A waterproofing membrane is applied to the rough slab and is tightly compressed between the sleeve flange and the clamping collar which in turn is secured in place with screws. Next, the floor finish is applied. After this is accomplished, the sleeve hub is packed with oakum and caulked with lead to offer positive assurance against any ground water seepage.

This type of sleeve is also very practical for upper floor watertight slabs. Here the sleeve will prevent seepage through the floor in the vicinity of the piping. When the floor area below is a finished area or contains equipment, moisture can be a damaging factor, especially if electrical equipment or apparatus is in that space. In this instance, the sleeve is applied in a manner similar to that shown in Fig. 6.

Vertical Risers

Vertical risers are part of many piping systems, including soil, waste, vent, standpipe, sprinkler, water and gas. Many types of sleeves may be used as long as they will permit passage for the riser. Several applications of this sleeve are shown in Fig. 7.

Type *A* of Fig. 7 features the application of a fabricated sleeve which, in this case, is used for the passage of leader piping. The sleeve is set in the forms before the floor slab is poured. Later, the leader line, in this case hub and spigot piping, is so installed that the hub will rest on the sleeve. This practice thus provides a dependable support for the vertical piping. For this installation, an ordinary piece of pipe with anchoring lugs or a flange welded in place will serve as an adequate sleeve.

Type *B* shows a method of providing a sleeve for all types of threaded piping systems. The sleeve is similar to that described in Type *A*. A riser clamp is used to support the piping. Several different types of riser clamps are available for this purpose, including the type of riser clamp that is of the offset type.

Type *C* shows a situation where the sleeve is extended above the floor, as may be required in exposed areas where floors are subject to washing with water. This arrangement prevents water from running down the piping to the floor below and thereby prevents staining of the piping. The escutcheon gives a neat appearance at the floor level while a ceiling plate is used to conceal the sleeve at the floor level below.

Type *D* shows a method of fabricating a pipe sleeve. It consists of a pipe flange into which prescribed lengths of pipe are threaded. Both halves of the flange is bolted together and if desired, gasket material can be inserted in the flange to offer a tight seal. The flange serves as

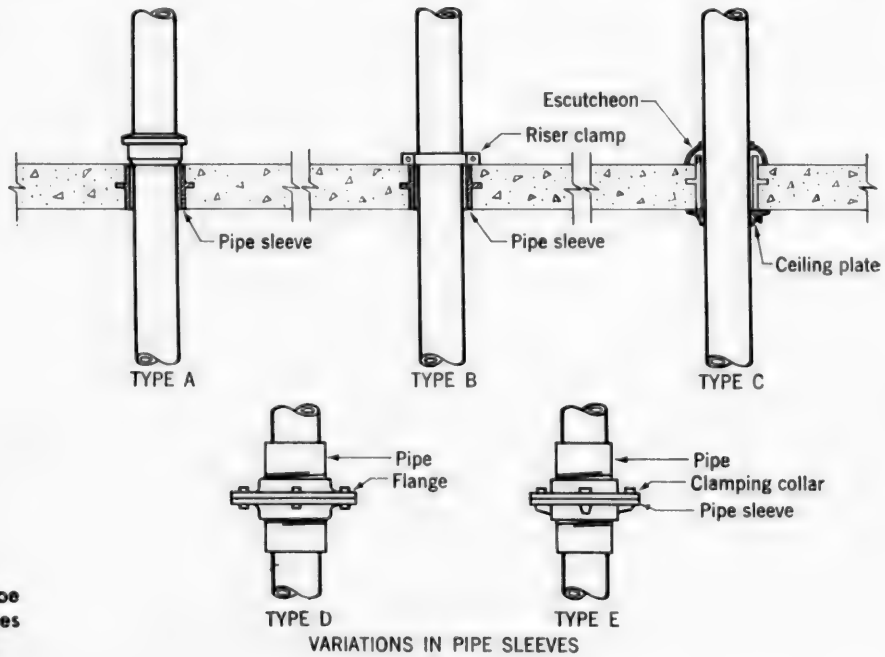
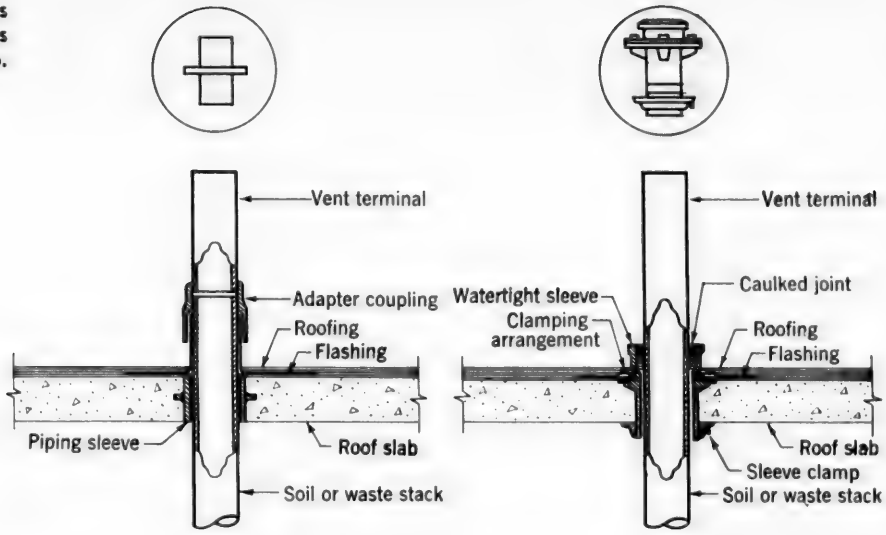


Fig. 7. How pipe sleeves may be used for vertical piping that passes through concrete floor slabs.

Fig. 8. Two types of piping sleeves that may be used for vent stacks that pass through the roof slab.



an anchor in the concrete. The piping should be of a diameter that is sufficient for the passage of the line it will handle. This is a quick method of fabricating a sleeve on the job for a specific installation.

Type *E* illustrates a manufactured device into which pieces of pipe are threaded to serve as a sleeve. This unit can be equipped with a clamping collar to permit installation of the unit in a watertight floor slab. Both *D* and *E* sleeves were shown to indicate the type of devices that can be assembled at the job site to serve specific needs. Each contractor will have a type he favors when the furnishing of piping sleeves becomes his responsibility.

Vent Terminal

Piping sleeves are also required at roof level and two such devices are shown in Fig. 8. The first type is a fabricated sleeve. It is placed in the forms for the pouring of the roof slab. Later the stack terminal piping is passed through the sleeve and terminates at a prescribed elevation above the roof level. A watertight condition is accomplished at roof level by means of the copper flashing and the adapter coupling. This method of waterproofing is clearly shown in the detail.

The other type of installation consists of a single hub sleeve that is set in the forms for the pouring of the roof slab. The flange of the sleeve is set flush with the top of the roof slab. Lead flashing and roofing is then applied. The lead flashing is secured in place by means of the clamping collar. The final application of roofing is then added to completely cover the clamping collar. An under-deck clamp is employed below roof level to lock the sleeve unit in place. The under deck clamp is secured with set screws.

In the meantime, the hub is packed with oakum and then caulked with lead to provide a dependable watertight seal. Both of these methods have been shown for example only, since there are a number of ways in which the vent terminal can be installed.

Piping sleeves are an important component of well designed piping systems. Therefore, they should be carefully handled in the drawings and specifications to be certain that the desired piping sleeve devices are used in each case.

Installation of Direct-Fed Incinerators

The first draft of the report, "Criteria Used in the Examination of Applications for Permits to Install Direct-Fed Incinerators", is being distributed to architects, engineers, installers and manufacturers of equipment, by the New York City Department of Air Pollution Control, according to an announcement by Commissioner Arthur J. Benline. One hundred and fifty copies have been distributed for review and comment.

A direct-fed incinerator is fed through a firing door and the flue is used only as a conduit for the gases of combustion and to produce a draft. Flue-fed incinerators, which are in general use in apartment houses in the City, are fed by the tenants through hopper doors on each floor, into a chute which carries the refuse to the basement burning chamber. The chute also acts as a flue during the burning cycle.

The criteria are designed to inform architects, engineers, installers and manufacturers of the methods of plan examination used by the Department's engineers. Comments are requested so that the benefit of the most advanced thinking will be available to the Department. It is intended that the criteria will be reviewed and revised from time to time as the art of burning refuse efficiently, effectively and without nuisance progresses.

The criteria are based on the experience of the Department, as well as the recommendations and standards of the Incinerator Institute of America, the National Board of Fire Underwriters, the Air Pollution Control Association, engineering textbooks, catalogs and brochures of contractors and manufacturers, the Rules and Regulations of the Department and the rules of similar regulatory agencies.

Commissioner Benline said additional copies of the criteria, for persons in the field of incineration, are available and may be obtained by writing to the Department, 15 Park Row, New York 28, N. Y.

DEGREE-DAYS FOR MARCH, 1960

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 32nd Year of Publication of Monthly Degree-Day Data

City	March			Season to Mar. 30, incl., from Sept. 1		
	1960	1959	Normal	1959-60	1958-59	Normal
Abilene, Texas (A)	482	299	344	2927	2643	2594
Albany, New York (A)	1184	1010	989	5993	6414	6045
Albuquerque, New Mexico (A)	462	587	589	3993	3808	4030
Alpena, Michigan (C)	1471	1194	1156	7223	6995	6604
Anchorage, Alaska (A)	1357	1575	1246	8265	9038	8434
Asheville, North Carolina (C)	969	624	572	4140	3768	3677
Atlanta, Georgia (A)	713	422	404	3059	2679	2673
Atlantic City, New Jersey (C)	988	740*	729	4206	4635*	4060
Augusta, Georgia (A)	637	352	308	2717	2384	2076
Baltimore, Maryland (C)	900	602	611	3982	3968	3804
Billings, Montana (A)	925	755	958	6128	5782	6091
Binghamton, New York (C)	1246	998	927	5406	6086	5662
Birmingham, Alabama (A)	637	404	378	2924	2703	2630
Bismarck, North Dakota (A)	1390	980	1187	7993	7946	7839
Block Island, Rhode Island (A)	1001	868	865	4593	4966	4782
Boise, Idaho (A)	681	737	719	5577	4451	5096
Boston, Massachusetts (A)	992	862	849	4789	5252	4972
Buffalo, New York (A)	1258	1050	992	5821	6026	5769
Burlington, Iowa (A)	1287	817	822	6104	5680	5463
Burlington, Vermont (A)	1267	1145	1107	6724	7201	6739
Cairo, Illinois (C)	911	487	523	4099	3671	3527
Charleston, South Carolina (C)	554	275	260	2146	1796	1726
Charlotte, North Carolina (A)	776	482	449	3316	3045	3004
Chattanooga, Tennessee (A)	801	540	467	3595	3353	3160
Cheyenne, Wyoming (A)	975	1045	1029	6390	5896	6138
Chicago, Illinois (A)	1192	853	868	5766	5669	5516
Cincinnati, Ohio (C)	1001	648	645	4443	4188	4110
Cleveland, Ohio (A)	1262	877	874	5413	5434	5196
Columbia, Missouri (A)	1118	623	698	5227	4583	4632
Columbia, South Carolina (A)	655	370	318	2814	2514	2207
Columbus, Ohio (C)	1109	787	741	5001	5042	4694
Concord, New Hampshire (A)	1150	1044	1029	6016	6673	6486
Concordia, Kansas (C)	1143	658	725	5704	4854	4816
Dallas, Texas (A)	488	259	288	2709	2303	2197
Denver, Colorado (A)	827	841	843	5537	4960	5240
Des Moines, Iowa (A)	1344	877	868	6605	5897	5745
Detroit, Michigan (A)	1196	945	927	5665	5778	5527
Devils Lake, North Dakota (C)	1588	1079	1314	9075	8564	8551
Dodge City, Kansas (A)	953	662	694	5269	4636	4561
Dubuque, Iowa (A)	1390	1054	983	6970	6786	6349
Duluth, Minnesota (A)	1475	1185**	1252**	8407	8425**	7929**
Elkins, West Virginia (A)	(a)	860	797	(a)	5327	4979
El Paso, Texas (A)	176	335	330	2446	2320	2531
Ely, Nevada (A)	792	901	921	6446	5722	6120
Escanaba, Michigan (C)	1385	1245	1203	7057	7416	7059
Evansville, Indiana (A)	1074	624	589	4695	4367	4013
Fairbanks, Alaska (A)	1885	2225	1736	11783	12881	11891
Fargo, North Dakota (A)	1526	1051	1231	8342	7915	8082
Fort Smith, Arkansas (A)	719	421	418	3636	3233	3037
Fort Wayne, Indiana (A)	1253	885	874	5817	5773	5475
Fort Worth, Texas (A)	499	276	308	2769	2406	2266
Fresno, California (A)	255	219	304	2177	1935	2344
Galveston, Texas (C)	264	137	176	1559	1291	1181
Grand Junction, Colorado (A)	697	728	738	5238	4603	5226
Grand Rapids, Michigan (A)	1268	1031	1008	6125	6300	6041
Green Bay, Wisconsin (A)	1405	1236	1132	7180	7473	7019
Greensboro, North Carolina (A)	919	565	528	3959	3667	3519
Greenville, South Carolina (A)	763	469	442	3325	2907	2867
Harrisburg, Pennsylvania (A)	1017	773	750	4780	4943	4693
Hartford, Connecticut (A)	1056	906	871	5311	5725	5365
Havre, Montana (C)	1139	816	1076	7128	7165	7120
Helena, Montana (A)	996	886	1017	7044	6753	6952
Houston, Texas (C)	248	133	166	1648	1361	1249
Huron, South Dakota (A)	1546	890	1032	7868	7091	6959
Indianapolis, Indiana (A)	1198	803	772	5480	5259	4973
Jackson, Mississippi (A)	550	321	299	2755	2371	2121
Juneau, Alaska (A)	1019	959	998	6078	6691	6569
Kansas City, Missouri (A)	1067	569	666	5037	4284	4477
Knoxville, Tennessee (A)	869	550	500	3761	3425	3344
La Crosse, Wisconsin (A)	1322	1114	1035	6860	7025	6743
Lander, Wyoming (A)	982	990	1045	7026	6453	7027
Lewiston, Maine (O)	1117	1036	1093	5961	6667	6625

a) Data not available.
* Figures based on Airport readings.
** Figures based on City office readings.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Co., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively.

Degree-Days for March, 1960 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 32nd Year of Publication of Monthly Degree-Day Data

City	March			Season to Mar. 30, incl., from Sept. 1		
	1960	1959	Normal	1959-60	1958-59	Normal
Lincoln, Nebraska (C)	1236	746	794	6198	5149	5277
Little Rock, Arkansas (A)	729	364	401	3396	2884	2842
Los Angeles, California (C)	111	49	212	824	655	1235
Louisville, Kentucky (A)	1002	627	611	4394	4135	4055
Lynchburg, Virginia (A)	933	595	584	4164	3877	3777
Macon, Georgia (A)	576	315	275	2485	2097	1987
Madison, Wisconsin (A)	1440	1098	1011	6978	6960	6342
Marquette, Michigan (C)	1353	1165	1181	7093	7155	6918
Memphis, Tennessee (A)	763	410	427	3429	3049	2974
Meridian, Mississippi (A)	534	335	309	2748	2468	2239
Milwaukee, Wisconsin (A)	1342	1050	983	6505	6595	6072
Minneapolis, Minnesota (A)	1395	956	1057	7266	6844	6919
Moline, Illinois (A)	1392	861	862	6328	5866	5659
Montgomery, Alabama (A)	497	314	288	2411	2093	2057
Nashville, Tennessee (A)	886	526	498	3931	3530	3284
New Haven, Connecticut (A)	1027	871	865	4897	5308	5128
New Orleans, Louisiana (C)	264	143	163	1542	1271	1156
New York, New York (C)	971	768	753	4439	4616	4423
Newark, New Jersey (A)	959	761	760	4408	4708	4643
Norfolk, Virginia (A)	796	478	500	3376	3122	3130
North Platte, Nebraska (A)	1143	871	887	6679	5859	5738
Oak Ridge, Tennessee (C)	895	625	633	3863	3669	3743
Oakland, California (A)	282	240	360	1959	1752	2389
Oklahoma City, Oklahoma (A)	777	481	472	4048	3612	3312
Omaha, Nebraska (A)	1290	790	831	6398	5521	5559
Parkersburg, West Virginia (C)	1038	724	672	4663	4618	4271
Peoria, Illinois (A)	1308	800	828	6033	5586	5408
Philadelphia, Pennsylvania (C)	922	677	667	4107	4273	4061
Phoenix, Arizona (A)	56	66	175	1437	1112	1430
Pittsburgh, Pennsylvania (C)	1066	779	735	4719	4825	4496
Pittsfield, Massachusetts (A)	1274	1064	1060	6327	6703	6475
Pocatello, Idaho (A)	(a)	842	880	(a)	5299	5962
Portland, Maine (A)	1159	1053	1039	6051	6737	6406
Portland, Oregon (C)	554	520	515	3577	3136	3500
Providence, Rhode Island (A)	1034	879	874	5042	5420	5213
Pueblo, Colorado (A)	817	772	775	5578	4774	5023
Raleigh, North Carolina (A)	845	504	440	3622	3341	2874
Rapid City, South Dakota (A)	1140	833	1045	6677	5946	6359
Reading, Pennsylvania (C)	985	740	725	4545	4758	4510
Red Bluff, California (A)	297	222	336	2175	1827	2318
Reno, Nevada (A)	638	686	756	5107	4581	4946
Richmond, Virginia (A)	894	542	550	3939	3657	3618
Rochester, New York (A)	1313	1073	992	6070	6193	5862
Roswell, New Mexico (A)	426	466	443	3480	3328	3211
Sacramento, California (C)	246	203	317	2098	1715	2314
St. Joseph, Missouri (A)	1216	666	648	5702	4973	4294
St. Louis, Missouri (C)	1027	589	620	4691	4204	4098
Salt Lake City, Utah (A)	692	722	741	5501	4563	5099
San Antonio, Texas (A)	291	173	190	1926	2678	1545
San Diego, California (A)	151	73	223	872	647	1265
Sandusky, Ohio (C)	1183	887	853	5435	5481	5088
San Francisco, California (C)	282	209	317	1611	1437	1996
Sault Ste. Marie, Michigan (A)	1442	1306	1302	7578	7931	7671
Savannah, Georgia (A)	535	257	238	2203	1824	1667
Scranton, Pennsylvania (A)	1225	911	859	5646	5896	5282
Seattle, Washington (C)	575	575	558	3553	3340	3595
Sheridan, Wyoming (A)	977	934	1035	6785	6444	6642
Shreveport, Louisiana (A)	511	287	272	2682	2265	2056
Sioux City, Iowa (A)	1454	870	930	7091	6182	6231
Spokane, Washington (A)	823	794	834	6189	5415	5770
Springfield, Illinois (A)	1257	719	713	5574	5113	4734
Springfield, Missouri (A)	1002	591	632	4781	4221	4256
Syracuse, New York (A)	1254	1045	955	5930	6278	5637
Toledo, Ohio (A)	1211	914	905	5852	5856	5522
Topeka, Kansas (C)	1145	622	669	5500	4737	4499
Trenton, New Jersey (C)	984	744	735	4480	4706	4495
Tulsa, Oklahoma (A)	808	416	485	3946	3390	3367
Utica, New York (O)	1181	928	989	5557	6272	5955
Valentine, Nebraska (A)	1243	901	970	7092	6279	6140
Walla Walla, Washington (C)	592	544	564	4614	3960	4301
Washington, D. C. (A)	905	607**	606**	3990	3921**	3864**
Wichita, Kansas (A)	962	555	619	4896	4327	4183
Williston, North Dakota (C)	1342	941	1194	8050	7789	7836
Winnemucca, Nevada (A)	694	804	794	5729	5021	5396
Yakima, Washington (A)	730	702	660	5461	5013	5172

For footnotes, see page 100

NEW LITERATURE

Use the prepaid postcard on last page for securing your copies of these catalogs.

Transmitter-Receiver Systems

Transmitter-receiver systems for remote temperature control and indication, manufactured by The Powers Regulator Co., Skokie, Ill., are described in Bulletin No. 371. Diagrams show schematically the use of system components in air conditioning, hot water, fan and process applications.

Circle **Item 1** on Inquiry Card

Industrial Thermometers

Gotham industrial thermometers are described in a 16-page catalog by U.S. Gauge Div., American Machine and Metals, Inc., Sellersville, Pa. Catalog No. 101 contains all necessary selection data, including socket and bushing dimensions, standard scale ranges, and accessories.

Circle **Item 2** on Inquiry Card

Electric Heating Thermostats

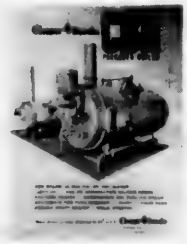
Edwin L. Wiegand Co., Pittsburgh, Pa., offers 4-page Bulletin R55100 that illustrates and describes its complete line of thermostats for controlling electric heaters in comfort heating applications. Description includes size, finish, electrical rating, and wiring diagram for each thermostat.

Circle **Item 3** on Inquiry Card

Circular Air Diffusers

Catalog CI-70, one of a series of 8 air distribution catalogs, available from Anemostat Corp. of America, New York, N. Y., describes the company's circular air diffusers. This 28-page catalog provides complete performance data for each diffuser, as well as dimensions and specs.

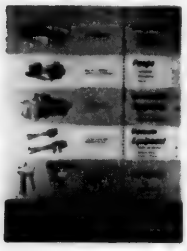
Circle **Item 4** on Inquiry Card



Packaged Boilers

Cleaver-Brooks Co., Milwaukee, Wis., announces a 4-page descriptive catalog listing advantages of its light oil, gas and combination fired CBH packaged boilers. A special section of the bulletin is devoted to an explanation of safety features built into every boiler in the CBH line.

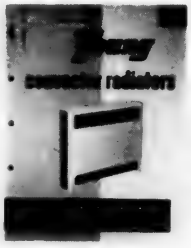
Circle **Item 5** on Inquiry Card



Products for the Plant

Ingersoll-Rand Co., New York, N. Y., offers an 8-page booklet to those concerned with selection and supervision of plant equipment. Compressors, pumps, condensing equipment, vacuum equipment, air hoists, and air and electric tools are illustrated and described in Form 223.

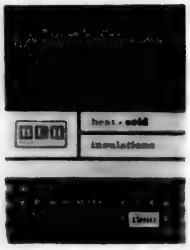
Circle **Item 6** on Inquiry Card



Convector Radiators

Young Radiator Co., Racine, Wis., announces a revised, 32-page catalog containing information on its recently enlarged and improved line of convector radiators. Catalog 4059 includes construction details, steam ratings, dimensional data, heating effects, and piping details.

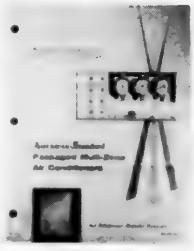
Circle **Item 7** on Inquiry Card



Industrial Insulating Materials

First catalog published since formation, by merger, of Baldwin-Ehret-Hill, Inc., Trenton, N. J., describes the line of over thirty industrial insulations manufactured by the new corporation. The 24-page catalog includes thermal conductivities and tables of recommended thicknesses.

Circle **Item 8** on Inquiry Card



Packaged Multi-Zone Conditioners

A 4-page illustrated bulletin describing its new line of packaged multi-zone air conditioners is available from American-Standard Industrial Div., Detroit, Mich. Bulletin 8625 covers both the single-zone basic unit and the multi-zone design, and includes specifications, dimensions.

Circle **Item 9** on Inquiry Card

Motor Operators, Motorized Valves

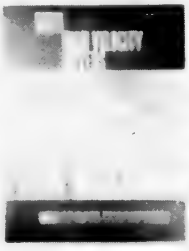
Schade Valve Manufacturing Co., Philadelphia, Pa., announces publication of 24-page Catalog No. 407 describing the Schade line of electric motor operators and motorized valves. Catalog contains ordering information, selection data, specification information and wiring diagrams.

Circle **Item 10** on Inquiry Card

Motel Heating and Cooling

A 17 x 22-inch illustrated sheet, designed to explain the operation of a combination hydronic heating and cooling packaged system for motels, is published by Edwards Engineering Corp., Pompton Plains, N. J. Detailed sheet includes electrical wiring arrangements and piping layouts.

Circle **Item 11** on Inquiry Card



High Velocity Dryers

J. O. Ross Engineering, Div. of Midland-Ross Corp., New York, N. Y., announces 4-page Bulletin HV-501 which gives technical data on three new high velocity dryers. Air outlet velocities range from 15,000 to 20,000 fpm with temperatures to 800 deg F and beyond.

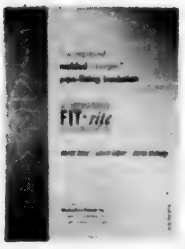
Circle **Item 12** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Flexible Air Duct

A 4-page brochure on its line of flexible air duct for air conditioning, industrial ventilating, and materials handling is issued by The Wiremold Co., Hartford, Conn. A selection guide to six types of duct contains complete specifications and application information.

Circle **Item 13** on Inquiry Card



Pipe Fitting Insulation

FIT-rite, a molded fiberglass pipe fitting insulation, is described in a 4-page bulletin (TD-105) available from Fibrous Glass Products, Inc., a subsidiary of Pall Corp., Hicksville, N. Y. Bulletin describes features and includes full insulation specifications, dimensional data.

Circle **Item 14** on Inquiry Card

Mercury Switches

A 12-page technical catalog, giving complete specifications on 21 special-purpose mercury switches, is announced by Gordos Corp., Bloomfield, N. J. The catalog shows all 21 mercury switches, as well as a variety of terminals and mounting clips designed for use with the switches.

Circle **Item 15** on Inquiry Card

Propeller Fans

A new line of low-speed, high-volume fans is included in Bulletin A-109E, published by Hartzell Propeller Fan Co., Piqua, Ohio. These and other fan models included in the 18-page bulletin are described with dimensions, air delivery data and construction details.

Circle **Item 16** on Inquiry Card

Valves: Gate, Check, Globe and Angle

Revised, 16-page Catalog 10-A, covering bronze and iron gate, check, globe and angle valves, is available from R-P&C Valve Div., American Chain & Cable Co., Reading, Pa. Operating specifications, characteristics, sizes and ratings are presented, with illustrations, in tabular form.

Circle **Item 17** on Inquiry Card

Air Conditioning Equipment

The Trane Co., La Crosse, Wis., announces major advances in air conditioning, heating and ventilating equipment, and offers an 8-page bulletin describing these new products. Includes fully hermetic packaged absorption water chiller, heating and cooling coils, unit ventilator, others.

Circle **Item 18** on Inquiry Card

Submersible Pump Motors

An 8-page brochure on its line of submersible pump motors is offered by U. S. Electrical Motors Inc., Los Angeles, Calif. Bulletin No. F-2000 illustrates and describes construction details and special features of submersible motors for 6, 10 and 14-inch well diameters.

Circle **Item 19** on Inquiry Card

Steam Injection Water Heating

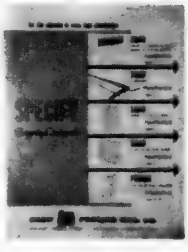
A 12-page bulletin, published by Pick Mfg. Co., West Bend, Wis., discusses the company's instantaneous hot water heater which utilizes direct injection of live steam into water. Bulletin describes method of operation, and includes selection data and installation diagrams.

Circle **Item 20** on Inquiry Card

Manually Operated Filters

Air Devices Inc., New York, N. Y., offers a 4-page bulletin describing its new line of Agitair Type DS Pull-Down filters for commercial and industrial applications. Catalog DS-100 contains performance data and dimensions for these manually operated filters.

Circle **Item 21** on Inquiry Card



Heat Distribution Equipment

Twelve-page condensed catalog, from Shaw-Perkins Mfg. Co., Pittsburgh, Pa., describes company's wall-hung and baseboard heat distribution equipment for commercial, domestic, institutional, and industrial installations, and introduces recently developed models for HTW applications.

Circle **Item 22** on Inquiry Card

Hermetic Liquid Chillers

Accessible hermetic liquid chillers in 7.5 to 45-ton capacities, for use with water-cooled, air-cooled or evaporative condensers, are described in 4-page Form LL-325, published by Airtemp Div., Chrysler Corp., Dayton, Ohio. Form includes complete capacity data, roughing-in dimensions.

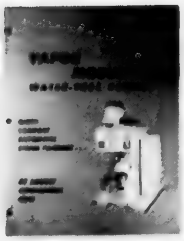
Circle **Item 23** on Inquiry Card

Steel Pipe and Couplings

Wheatland Steel Products Co., Philadelphia, Pa., offers a 4-page bulletin which gives sizes, lengths, threads, weights and carton contents of merchant, half, and API line pipe couplings. It also contains information, including complete specifications, on the company's steel pipe.

Circle **Item 24** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.



Water Tube Boilers

Bulletin No. 4010, from Vapor Heating Corp., Chicago, Ill., describes company's economy line of water tube package boilers, called the Cycle Modulatic. Bulletin points out advantages of this "on-off" type boiler, and discusses boiler's built-in control for temperature and pressure operation.

Circle **Item 25** on Inquiry Card

Skylights and Ventilated Skylights

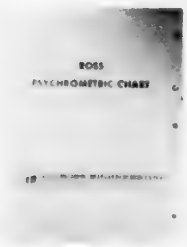
Jenn-Air Products Co., Inc., Indianapolis, Ind., offers 8-page Bulletin 60-LV which gives full details and specifications on its Astro-Lites (skylights) and Astro-Vents (ventilated skylights). Bulletin includes installation drawings, dimensions, dome and electrical specifications, curb details.

Circle **Item 26** on Inquiry Card

Close-Coupled Pump Motors

Bulletin MU-244, from Wagner Electric Corp., St. Louis, Mo., describes doubly-protected dripproof and totally-enclosed polyphase squirrel-cage motors, 1 hp and larger, with NEMA "C" faceplates for close-coupled centrifugal pump use. Includes electrical, mechanical features.

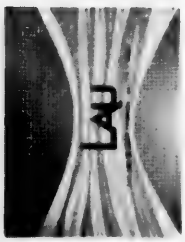
Circle **Item 27** on Inquiry Card



Psychrometric Chart

J. O. Ross Engineering, a div. of Midland-Ross Corp., New York, N. Y., announces that a new and expanded edition of the Ross psychrometric chart is available. The chart now covers a dry bulb temperature range from 50 to 350 deg F, in 5-deg increments.

Circle **Item 28** on Inquiry Card



Air Conditioning Blowers

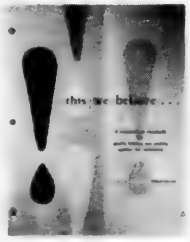
A 12-page booklet describing its standard line of blower assemblies, blower wheels and parts is available from The Lau Blower Co., Dayton, Ohio. Each blower and wheel description contains an illustration and cross-reference to the Lau engineering catalog.

Circle **Item 29** on Inquiry Card

Submersible Accessories

Franklin Electric Co., Inc., Bluffton, Ind., offers a 4-page folder which illustrates and describes accessories designed as aids for better installation of submersible pumps. Included are noise suppression devices, couplings, lightning protectors, cable termination kits and motor lead drop cables.

Circle **Item 30** on Inquiry Card



Quality Heating and Cooling

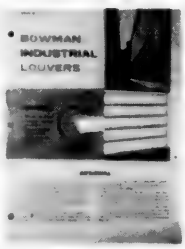
Quality standards, regardless of equipment brand, for residential heating and cooling are stated in 16-page booklet by Lennox Industries Inc., Marshalltown, Iowa. Standards are stated in a manner that can be checked by any qualified contractor, engineer or utility company person.

Circle **Item 31** on Inquiry Card

Solar Screens

Federal Seaboard Terra Cotta Corp., New York, N. Y., announces an 8-page brochure illustrating and describing 12 standard grille designs which are now available in Ceramic Veneer. Offered in a wide range of colors, these solar screens provide sun control, ventilation, or privacy.

Circle **Item 32** on Inquiry Card



Industrial Louvers

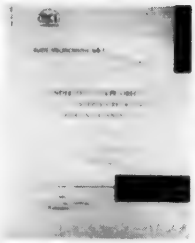
Bowman Steel Corp., Pittsburgh, Pa., announces Bulletin IL-1 describing its improved line of industrial louvers. Said to be an outstanding advancement in louver design is the new curved return blade which effects more efficient air intake and weather protection.

Circle **Item 33** on Inquiry Card

Silencer Products

An 8-page pamphlet is published by Acoustical Div., Elof Hansson, Inc., New York, N. Y., listing all its types of silencer products for air conditioning, heating and ventilating systems. Literature gives dimensional data, certified sound attenuation and pressure drop.

Circle **Item 34** on Inquiry Card



Underfeed Stoker Applications

Guide specifications for underfeed stoker applications to boilers best suited for low-pressure commercial and industrial heating plants are subject of Brochure GS-1, published by Bituminous Coal Institute, National Coal Association, Washington, D. C. Includes detailed boiler room layouts.

Circle **Item 35** on Inquiry Card

Water-Repellent Masonry Insulation

Two booklets describing advantages and applications of Zonolite water-repellent masonry fill insulation for brick cavity and concrete block walls are available from Zonolite Co., Chicago, Ill. Data include thermal efficiency, estimated fuel and air conditioning savings, and coverage tables.

Circle **Item 36** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Air Conditioning Units

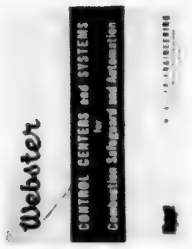
A completely revised catalog describing its Type V-UHT vertical and horizontal air conditioning units is announced by Recold Corp., Los Angeles, Calif. Catalog No. 54C9c contains general specifications, dimensions, arrangements and installation instructions for these units.

Circle **Item 37** on Inquiry Card

Hot Water for Laundries

Catalog CH-108, a 100-page loose-leaf catalog of hot water heating data for commercial laundries, self-service laundry stores, and hand laundries, is available from Permaglas Div., A. O. Smith Corp., Kankakee, Ill. It includes new water heater sizing tables, piping system diagrams, etc.

Circle **Item 38** on Inquiry Card



Control Centers and Systems

Control centers and systems for combustion safeguard and automation are the subject of a 20-page brochure offered by Webster Engineering Div., Midland-Ross Corp., Tulsa, Okla. Nine custom-engineered control centers and systems are illustrated and described in Bulletin No. C11.

Circle **Item 39** on Inquiry Card

Combination Gas-Oil Burners

Office Buildings, one of an installation series published by Ray Burner Co., San Francisco, Calif., details use of the company's combination gas-oil burners in new Union Oil Building, Los Angeles. The "boiler room" part of the installation is covered with specifications, combustion data.

Circle **Item 40** on Inquiry Card

Water Cooling Coils

A 60-page catalog, specifically designed for quick and accurate selection of water cooling coils, is announced by McQuay, Inc., Minneapolis, Minn. Various types of water cooling coils are described in Catalog No. 406 with complete circuiting illustrations and application advice.

Circle **Item 41** on Inquiry Card

Motor Controls

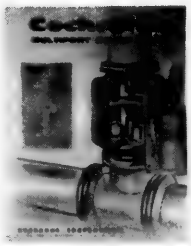
A 6-page bulletin describing Type RA (Right Angle) starters and contactors is offered by The Arrow-Hart & Hegeman Electric Co., Hartford, Conn. It defines the principle of the "RA" design, and explains how these controls offer reduced size and weight without sacrificing performance.

Circle **Item 42** on Inquiry Card

Combustion Chambers

Cerafelt combustion chambers, described as a revolutionary advance in the maintenance of domestic oil burners, are described in a 4-page folder by Johns-Manville, New York, N. Y. Folder IN-256A describes their advantages, and illustrates method used for installation.

Circle **Item 43** on Inquiry Card



Multiport Relief Valves

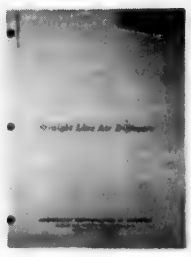
Bulletin 5200-A, from Cochrane Corp., Philadelphia, Pa., describes and illustrates the company's complete line of multiport relief valves for automatic, safe relief of overpressure in steam, gas and air systems up to 250 psig. Bulletin covers applications and operation, lists basic sizing data.

Circle **Item 44** on Inquiry Card

Packaged Automatic Boilers

A 4-page bulletin on its line of Powermaster Model 5 packaged automatic boilers is offered by Orr & Sembower, Inc., Reading, Pa. Line includes high and low pressure types in 20 to 100 hp sizes, fired by oil, gas and combination gas-oil. Ratings and dimensions are given.

Circle **Item 45** on Inquiry Card



Straight Line Air Diffusers

Anemostat Corp. of America, New York, N. Y., also offers Catalog SL-70 describing its straight line air diffusers. This 12-page catalog lists dimensions and performance data for these diffusers, and includes selection data, installation information and typical specifications.

Circle **Item 46** on Inquiry Card

Pipe Alignment Guide

The Align-O Guide is a pipe alignment guide which permits only axial movement of a pipe line under temperature change. Used before and after expansion joints and loops, it is said to prevent failure of joint or loop. The Align-O Pipe Guide Co., Upper Darby, Pa., offers brochure.

Circle **Item 47** on Inquiry Card

DWV Copper Tube and Fittings

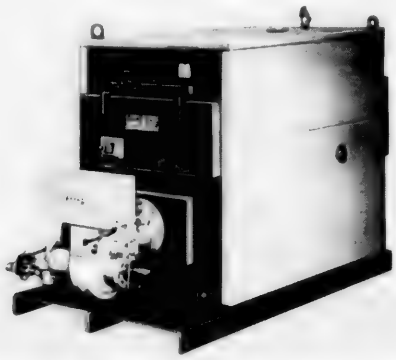
Mueller Brass Co., Port Huron, Mich., announces a 36-page catalog which describes its Streamline DWV copper tube and solder-type fittings. Catalog includes engineering information on drainage and vent applications. Company asks that you request Catalog D-459 on your company letterhead.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Boiler-Burner Unit Needs Less Room

A boiler-burner unit, called Petro-Pac, is said to operate at more than 80% efficiency and to reduce head room by as much as 24 inches. The latter is achieved, Petro,



of Cleveland, Ohio, states, through design refinements which make the conventional boiler base unnecessary.

Involving the company's PowerBlast burner meshed into the firebox type boiler, the re-designed firebox forced draft package unit will service the steam or hot water requirements of buildings containing from 6,000 to 60,000 sq ft of floor space (large restaurant or four-apartment building to a medium-sized school, large commercial building or warehouse).

Output range of the firebox unit is 396,000 to 1,800,000 Btu per hr. Pressure firing eliminates chimney or smokestack. The refractory combustion chamber is eliminated.

More information? Circle Item 48, postcard, last page.

Remote Air Conditioners

Two new remote air conditioning systems with nominal capacities of 10 and 15 tons have been introduced by Air Conditioning Div., Westinghouse Electric Corp., Staunton, Va. These air-cooled units are particularly applicable in large commercial installations such as supermarkets or in industrial plants, the company states. They extend the present line of Westinghouse air-cooled remote air conditioning systems to a total of eight units in sizes from 2 to 15 tons.

The outdoor sections, the condensing units, include high-capacity condenser coils located on each side of the unit. The coils are finned-tube-type with aluminum fins mechanically bonded to seamless copper tubing and are completely waterless in operation. With vertical discharge propeller fans, outdoor sections are said to be attractive in appearance with a low silhouette for roof-top mounting.

Units are equipped with twin compressor systems, each with a matching fan and coil unit, that can be turned on individually to give half-capacity operation for light cooling loads. In addition, the outdoor condensing units can be used separately with two 5-ton or 7½-ton fan-and-coil units to provide zone control if desired.

A built-in time delay relay in these systems permits step starting to meet electric utilities' starting limitations in certain areas. Condensing units are designed for easy access by simple removal of two end panels and lifting of the hinged top.

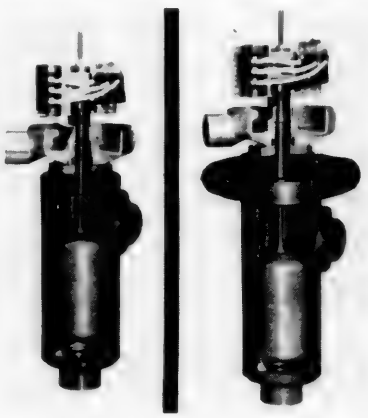
The indoor fan and coil units are of modular design for flexibility of application. For example, the fan section can be mounted at the side or on top of the coil assembly; and, the unit can also be adapted to three directions of fan discharge.

More information? Circle Item 49, postcard, last page.

Liquid Level Controls

Low-cost liquid level controls in which all parts of the control in contact with liquids or vapors are nonmetallic (PVC) are announced by Magnetrol, Inc., Chicago, Ill. Models NM-1 and NM-2 are for use in controlling liquids that present problems in handling.

Controls are immune to galvanic or electrolytic attack; corrosive resistant; immune to oxidizing agents; they



have smooth surfaces that discourage any tendency to scale or act as host for deposits; and they will not contaminate or impart odors or tastes to the liquid. Safety in handling inflammable and explosive liquids as well as in volatile fume areas because the construction is of non-flammable and non-sparking materials is another advantage. Chamber and float construction are for service at 100 psi at 70 deg F, or 50 psi at 140 deg.

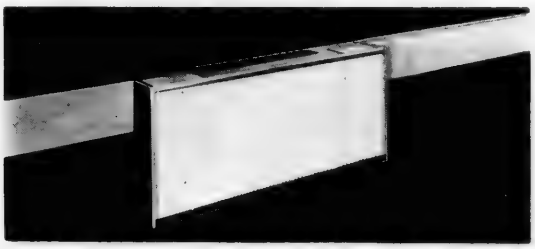
Model NM-1 (left) is an external float cage unit with a sealed body and float totally enclosed. Model NM-2 (right) is a flanged style chamber unit, with head flange secured to the chamber by means of a Victaulic closure with gasket. They are provided, on standard units, with 1-inch pipe socket connections.

More information? Circle Item 50, postcard, last page.

Space-Saving Unit Ventilators

A line of schoolroom unit ventilators, said to occupy 21% less floor space than previous heating models and 29% less than other air conditioning models now on the market, is announced by The Trane Co., La Crosse, Wis.

The unit ventilators, which heat, ventilate, and can provide complete year-round air conditioning, are only 11⅝ inches deep, as compared to the previous industry standard width of 16⅜ inches. With matched shelving



units installed from wall-to-wall, this can mean a space saving of more than 14 sq ft in the average classroom, the company points out.

Units incorporate the kinetic barrier principle which the company developed to combat downdraft from the large window-walls of modern school classrooms. By means of integral lateral extensions from either or both sides of the unit, conditioned air can be discharged upward all along the window-wall from sill level. Powered by fan in the unit ventilator, kinetic barrier action operates whether the unit is on a heating, ventilating or air conditioning cycle.

Possible variations of the components and accessories of the unit ventilator allow selection to meet the exact requirements of any school in any climate. Five units are available for steam, hot water or electric heating . . . and now both heating and air conditioning. For example:

Heating Unit, Valve Control

One unit is a heating and ventilating unit ventilator with valve control designed for either steam or hot water systems. Four different steam or hot water coils provide a wide range of heating capacities to meet the requirements of any outside design condition. Mixing dampers in the base of the unit cabinet provide any desired percentage of outdoor air for ventilation.

Bypass Control

Another unit is a heating and mechanical cooling unit ventilator with bypass control. A new dual coil design provides chilled water cooling and hot water heating in a capacity range that will meet the requirements of any climate. Capacity is modulated by bypass dampers on the coils. Mixing dampers in the unit base permit desired proportion of outdoor and recirculated air for ventilation. Installation of this unit permits immediate air conditioning or provides for future air conditioning without alteration of the unit ventilator.

All Climate Heating Unit

A third unit is a heating unit ventilator with bypass control. A new, interlocking bypass damper modulates unit capacity through heating and ventilating cycle.

Mild Climate Unit

Also available is a heating and ventilating unit designed specifically for economical installation in milder climates. Two hot water coils provide capacities matched to loads in areas with higher design temperatures. A bypass damper simultaneously modulates coil capacity and introduces outdoor ventilation air.

Electric Heating

For areas where electrical rates are feasible, a unit equipped with an electric resistance heating element is available. Step controlled modulation of the element matches unit output to heating requirements. Mixing dampers in the cabinet base provide any desired proportion of ventilation air.

More information? Circle Item 51, postcard, last page.

Liquid Leak Detector

Availability of a liquid leak detector, called Search, is announced by Watsco, Inc., Hialeah, Fla.

Cataloged Part No. DL-1, the detecting fluid is a special formula designed to pin point the slightest leak upon application to the suspicious area.

According to the manufacturer, the formula's high viscosity enables it to cling and wrap itself around any tubing or fitting to cover all possible leakage points.

The fluid is contained in an unbreakable squeeze-type bottle with a self applicator. Since it incorporates no open flame, this leak detector is most suitable for automotive air-conditioning servicing.

More information? Circle Item 52, postcard, last page.

Fan and Limit Control

Series 530 combination fan and limit controls have been specially designed by Penn Controls, Inc., Goshen, Ind., for warm air heating systems. Controls are compact, and are said to look attractive on any furnace. The series contains two separate switching units, each independent of the other. Both switching units are operated by a single liquid-charged temperature element for uniform, reliable operation.

According to the manufacturer, a desirable feature of Series 530 is "loss of charge protection". If the element should lose its charge, for any reason, the safety limit switch will open to prevent the heating unit from operating in an unsafe condition. Several models are presented for the customer's selection, including window in cover, adjustable differential on the fan switch, and summer fan selector switch.

More information? Circle Item 53, postcard, last page.

Epoxy Resin Coating Protects Pipe from Corrosion

A new epoxy resin pipe coating which the manufacturer claims can be applied more easily and quickly than conventional mill coatings, and at a competitive price, has been announced by Minnesota Mining and Mfg. Co. (3M), St. Paul, Minn.

The one-part powder, called Scotchkote brand pipe protection resin No. 101, cures in less than 20 seconds with close coating tolerances. Solvent hazards and post-baking, normally associated with epoxies, are eliminated.

This coating, for the first time, brings the physical and electrical properties of epoxies to the corrosion field at a price that will allow universal use, the company states.

Field experience has shown that the resin coated pipe can be handled in much the same manner as bare pipe. In addition, welding of pipe sections can be accomplished through the resin coating, once an arc has been struck on a bared spot.

The resin, upon application, is completely thermoset, and will not flow under pressure nor flow upon heating. It has an adhesion strength of 3,000 psi, and high impact strength which resists damage from soil or pipe movement, and the abrasion and shock of back-filling. As an example, the impact strength of the resin was illustrated by demonstrations in which an 8-lb ball was dropped repeatedly from a height of 6 ft on a ⅛ inch steel panel coated with the product. The coating remained continuous, even though the panel was dented.

The resin resists attack by most chemicals, including hydrocarbons such as fuel oil, gasoline, kerosene and sweet or sour crude. In salt crock tests, the resistance of the coating remained at a constantly high level for two-year periods of immersion under both anodic and cathodic conditions. A typical resistance value of a 10 mil coating is 10,000 megohms per square foot.

Mill application of the coating is a four-step process consisting of cleaning, heating, coating and jeeping the pipe. In addition to major use as a pipe protection coating, it can be applied to fittings, meter brackets, transformer cases, beams, supports and other related objects.

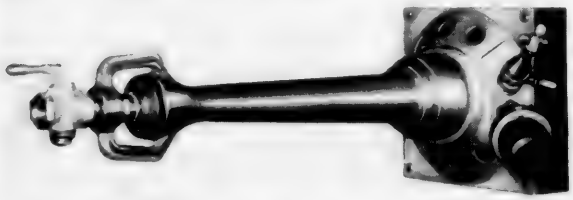
Utilities and pipe coating concerns, working with the resin on a pilot plant basis, have estimated that the cost of the resin-coated pipe "in the ground" will be competitive with conventional mill coatings. Savings are expected because of reduced shipping and handling damage, the ability to ship more pipe per carload, due to the thin (10 mil) coating, and the reduced amount of joint insulation material, as cut-backs on the ends are not usually required.

The resin is available to applicators, the manufacturer states. At the present time, several pipe coating companies have built pilot facilities and are supplying coated pipe. Initial emphasis has been placed on coating two inch and smaller pipe; however, pilot plant facilities are being expanded to handle large diameter pipe.

More information? Circle Item 54, postcard, last page.

High Input Burners

Four Buzzer models of air heater venturi register burners, Series AHVR, are introduced by Charles A. Hones, Inc., Baldwin, L.I., N.Y. Illustrated is Model AHRV-300 with 500,000 Btu input. Lowest input in the series is 200,000 Btu; the highest, 1,000,000 Btu.



According to the company, the burners are used in a wide range of suction applications and that in any typical use of the burners with a 0.25 inch constant suction on the retaining port nozzle, it provides double the Btu inputs of standard register burners.

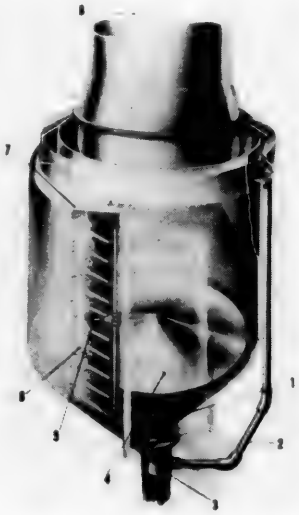
The register is 3 inches thick and consists of an adjustable secondary air shutter with the plate equipped for flame rod and pilot mounting. These burners, requiring no blower or other auxiliary power, can also be supplied with a special cast iron box for easy adaptation to brick wall setting when required. Installation and maintenance are simplified by elimination of refractory burner block, which other burners require for flame retention.

Accessories, such as cast iron box, pilot and draft extension, spark ignition, rectifier holder, combustion safeguard, switches, etc., are available from manufacturer's stock or through local distributors, as required.

More information? Circle Item 55, postcard, last page.

Small, High-Energy Scrubber

A high-energy dust and fume scrubber called the Oriclone is introduced by The Ducon Co., Mineola, N. Y.



According to the manufacturer, the scrubber, available in capacities from 10,000 to 40,000 cfm, takes half the space of comparable high-energy units, offers higher operating efficiencies, has adjustable orifices for maintaining peak efficiency when operating conditions vary, and is 99% efficient even on sub-micron size particles.

Scrubber is said to be one of the few wet collectors whose performance can match that of the electrostatic precipitator. Illustration numbers refer to (1) gas inlet, (2) overflow pipe, (3) sludge outlet pipe, (4) gas-liquid separating baffle, (5) water inlet, (6) atomized water, (7) adjustable orifice plate, and (8) gas outlet.

The adjustable rectangular orifice is advantageous in processes where operating conditions vary. Unit is well suited to control acid mists, tar fog, petroleum coke dust, fumes from metallurgical operations, catalyst dusts, and other fine particles.

More information? Circle Item 56, postcard, last page.

Air-Cooled Packaged Unit

A horizontal, air-cooled packaged air conditioning unit has been developed by Airtemp Div., Chrysler Corp., Dayton, Ohio. The versatile packaged unit is the Model 1104-00, which has a 35,000 Btuh capacity, and it is designed for homes, small apartments and office buildings.

Designed for either interior or outdoor installation, unit can be placed in attics, crawl spaces beneath a home, roof tops or a slab outside the building. The cabinet measures 45 15/16 inches wide, 39⅞ inches deep and 20⅜ inches high.

Unit can also be utilized on a commercial building, with air easily ducted through the skylight, or in an office building. In the latter installation, condensed air can be ducted in and out through small weather louvers to take care of small suites of offices. Multiple use of units would handle larger areas and there is no need of refrigerant piping or condenser water piping.

A small panel in the shell allows quick and simple field wiring and in case of repairs the conditioner can be serviced at its location by removing either the side or top panels.

Installation work is minimized by another feature which permits the package to be separated with the removal of nine bolts. This divides the blower section and the refrigeration section into two packages of 171 and 288 lb, respectively, for easy passage through tight accesses, and the unit is easily assembled in its final location.

One of the air conditioner's handiest features is a reset switch on the thermostat. This permits re-starting the unit at the remote thermostat instead of climbing or crawling to the air conditioner's installation for resetting. This model makes use of two blowers for quieter operation and is mounted to springs which eliminate vibration.

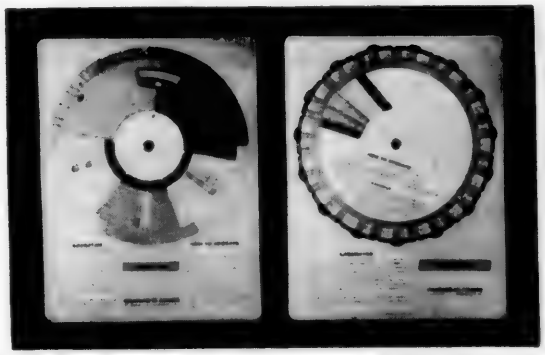
Duct connections permit flexible use of indoor or outdoor duct arrangements. This feature is especially adaptable to home owners who desire to match the installation to a particular type of architecture.

More information? Circle Item 57, postcard, last page.

Calculator Determines Piping Labor

The Laborator is a circular calculator designed for estimating labor on piping systems. It simplifies the method of determining the labor involved to install various types of piping systems where pipe and fittings are to be either welded, screwed, soldered, or caulked with lead.

Due to the variable working conditions that affect each job, the labor factors for each installation are divided into five different labor bases or units. Each labor base is given in man-hours and fraction of man-hours, except



for underground and above-ground soil and Duriron piping which is given in lead joints per man-day.

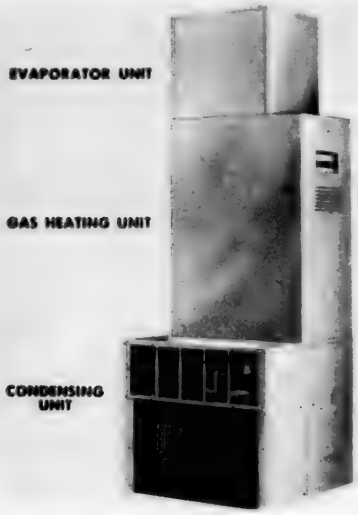
One side of the Laborator establishes the man-hours for copper tubing, screwed piping, screwed waste and vent piping, and underground and above-ground soil and Duriron piping. Pipe sizes are from ½ through 12 inches, except copper tubing which is from ½ through 6 inches. Man-hours include handling of pipe and fittings, measurements, cutting, threading, soldering, yarning, leading and caulking.

The other side establishes the labor man-hours for welding carbon steel pipe and fittings from ½ through 12-inch pipe sizes. It includes butt-welding of Schedules 40 and 80 piping, nozzle welding for pipe with ⅜ and ½-inch wall thickness, slip-on welds for 150-lb and 300-lb flanges, and shows how labor for socket welding can be obtained.

The calculator is available from Charles M. Adams, P. O. Box 9101, Huntington 4, W. Va. Price is $7.50.

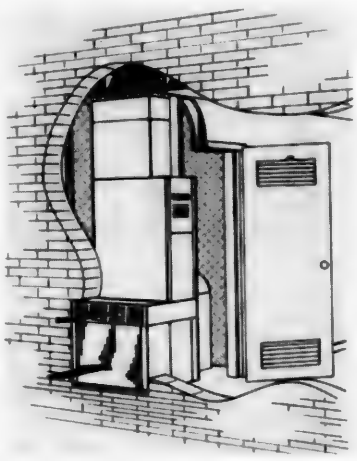
Apartment Heating-Cooling Package

An unusual heating-cooling package for apartments and small commercial applications is offered by Lennox Industries, Inc., Marshalltown, Iowa. All the equipment,



including gas furnace, cooling coil and air-cooled condensing unit, fits within a 36 x 36 inch closet. It provides complete, ducted, all-season comfort conditioning for an apartment, with individual control for that apartment.

The company predicts that builders will like the ease of installation and the favorable price in comparison with multi-zoned systems of other types. Another advantage claimed is that, by putting the heating and air conditioning under the tenant's responsibility, the builder frees working capital.



Installed, the air handling face of the condensing unit extends through an outside wall and is flush with the outer wall surface. The part of the condensing unit that remains in the closet becomes the base for the furnace. The cooling coil is mounted on top of the furnace. Completely assembled, the unit requires only 89 inches headroom. Trunk duct is taken off the side of the cooling coil cabinet. This cabinet can even be trimmed down another four inches if desired. Return air can be brought back between floor joists or through grilles in closet walls.

Many Installation Alternatives

Unit provides a nominal 2 tons of cooling and 51,000 Btuh input of heating (all gases). For convenience, the furnace can be set facing either right or left.

Design of the condensing unit lets it handle intake and exhaust air on the same side. Or, by switching face plates, exhaust can be from either right or left side. This feature increases application possibilities, such as air shaft applications in apartment buildings. In such a case, condenser supply and exhaust air are handled in separate air shafts which are a part of the building construction. These shafts can be sized to accommodate condenser air for the entire building. (If desired, the condensing unit can be separated from the complete package and installed anywhere.)

Pre-charged refrigerant lines with self-sealing quick couplers are standard equipment. They permit safe storage and a quick "marriage" of the condensing unit and cooling coil at time of installation.

The furnace has a continuous welded heat exchanger, aluminized steel burners, 100% safety shut-off, built-in draft diverter, 24-volt control system, "hammock" type throwaway air filter and a quiet direct-drive blower.

Steel cabinets have deluxe baked enamel finish. Cooling units have ½-inch acoustical fiberglass insulation.

Cooling Enhances Performance

A new refrigerant circuiting method in the large four-row condenser coil increases the amount of refrigerant sub-cooling, according to the company. It is claimed this improves Btu-per-watt performance because the liquid refrigerant reaches the evaporator coil up to 20 deg F cooler than the condensing temperature.

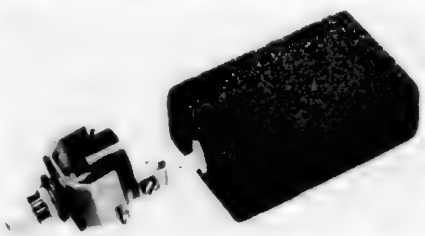
Room-type combination heating-cooling mercury bulb thermostat is included. It has a manual changeover switch.

More information? Circle Item 58, postcard, last page.

New Type Valve Developed

A new type float valve has been developed by Skuttle Mfg. Co., Milford, Mich. The valve operates on a single pivot principle for trouble-free use, the company states.

Called the A-1106-9, the valve is simplified to the



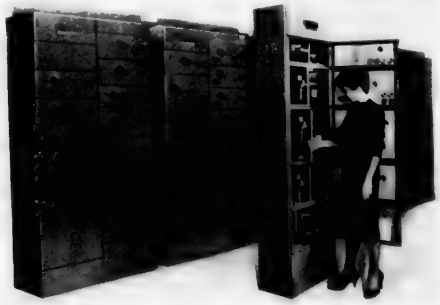
point that there are no moving parts. The all-rubber valve seat is adjustable and can be reversed. Design of the valve seat enables it to act as a splash shield, and to be easily replaced. Another feature is the chrome plated valve jet that assures positive shut-off.

The manufacturer states that this valve and foam glass float assembly is well suited for evaporative coolers, ice making machines, and other automatic water control operations.

More information? Circle Item 59, postcard, last page.

Motor Control Centers

Motor control centers with bus capacity from 200 to 2000 amps for voltages from 110 to 600 are available from Allis-Chalmers Mfg. Co., Milwaukee, Wis. The centers, offering improved operation, easier maintenance and increased versatility over individual units, are used to control electrical loads such as motors, lighting, welding and heating in industrial plants and commercial buildings.



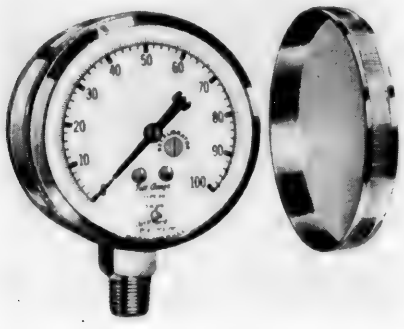
Available either as fusible or circuit breaker combination units, the control centers consist of two or more starters fed from a common bus and are often attached to transformers or switchgear to form a unit substation. Substations can be purchased as a complete package or as individual units. All control compartments of like size are interchangeable anywhere in the control panel.

Of primary interest to users are the reduced engineering and installation cost savings in floor space up to 33%; versatility of unit through plug-in design which means that units can be easily moved from one location to another as needed; only one main circuit breaker is needed for one center; and equipment arrangement is neater, being centralized rather than spread out.

More information? Circle Item 60, postcard, last page.

Inspectors' Test Gage

Type 28 test gages, designed for inspectors of boilers, air brakes, and similar pressure systems, are available from Marsh Instrument Co., Skokie, Ill.



Units are manufactured in heavy brass cases with knurled screwed ring giving quick access to the company's Recalibrator for keeping the gage accurate at all times—an important feature in a test gage.

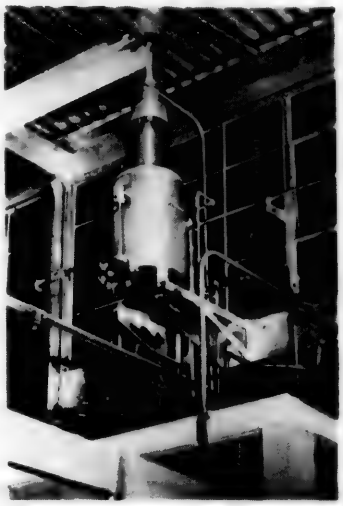
All gages are 3-inch dial size: 11 pressure ranges from 0-15 through 0-1000 psi; 7 compound ranges from 30 inches x 15 psi through 30 inches x 300 psi. All have the new company's Read-easy dial which, along with twisted knife-edge pointer, assures accurate reading of the fine primary divisions. They are available in polished brass, nickel or chrome plated finishes and with protective cover when desired.

Gages are guaranteed accurate within ½ of 1% plus or minus the maximum dial reading over the entire range.

More information? Circle Item 61, postcard, last page.

Industrial Water Heater

Valuable plant floor space is not required when installing a modern industrial water heater such as manufactured by Permaglas Div., A. O. Smith Corp., Kankakee, Ill. Shown in photo is a compact and lightweight Burkay industrial water heater installed up on a shelf and out of the way over a tool crib. Mounted near the ceiling and opposite the skylight windows, this water heater is easily flued out the roof.



Units are available in a full range of sizes up to 420,000 Btu per hr. Copper construction includes a fin and tube heat exchanger and a water-wall combustion chamber for long life and economy of operation, the manufacturer reports.

More information? Circle Item 62, postcard, last page.

Underground Insulation Primer

This spring and summer, one of the most efficient thermal insulating materials for underground service will be even more efficient than before, according to Insul-Fil Co., a div. of Miracle Adhesives Corp., Belmore, L. I., N. Y.

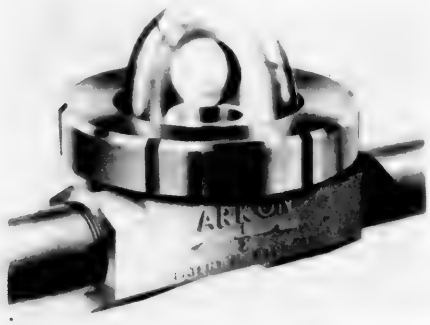
An improved formulation of Insul-Fil Primer 7591 for warm weather has now become available. This primer facilitates the formation of a tougher, protective plastic zone around underground pipes at lower temperatures and in less time than previously possible, the firm reports.

Furnished without charge with each shipment of Insul-Fil, the primer assures continuous adhesion of the plastic zone to the pipe. This, the company points out, prohibits the formation of voids which are detrimental both to the insulation and to the pipe surface itself.

More information? Circle Item 63, postcard, last page.

Indicates Very Low Flows

The Akron ball type flow indicator, offered by Walker, Crosweller Div., McIntosh Equipment Corp., New York, N. Y., is applicable to flows down to 0.075 gpm (water) and 0.5 cfm (air or gas). It shows at a glance whether flow is taking place.



According to the company it is clearly visible from a distance, even in bad light, as the flow makes the ball dance in the toughened glass dome. When flow stops, the ball drops out of sight.

Recommended applications include air, steam, water, and oil purge lines to instruments and mechanical seals; cooling water to compressors, condensers, jacketed process vessels, laboratory equipment, and lubricating oil to bearings.

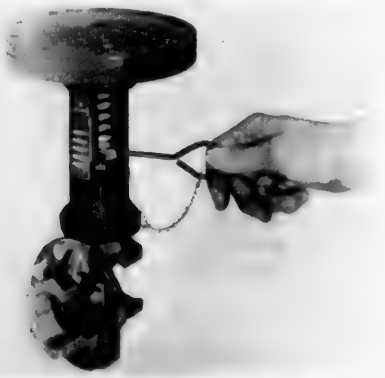
Unit is made in ½-inch pipe size for pressures up to 100 psi, with die-cast body and either nylon or Teflon ball.

More information? Circle Item 64, postcard, last page.

Control Valve Setting Simplified

Every one of its diaphragm control and temperature control valves from ¼ to 2 inches in size is now equipped at the factory with a loss-proof adjusting rod at no extra cost, OPW-Jordan Corp., Cincinnati, Ohio, announces.

Securely chained to each sliding gate and plate control valve, the rod is immediately available when needed. The



rod fits into holes provided around the circumference of the valve's adjusting wheel. When turned, the adjusting wheel changes the set point by varying the load on the main adjusting spring.

Standard sliding gate seats are stainless steel, industrial hard chrome plated for long life, requiring minimum maintenance. Seats are self-lapping and self-cleaning in operation and give tight shut-off.

More information? Circle Item 65, postcard, last page.

Combination Ventilator-Skylight

A unit which is both ventilator and skylight has been introduced by Swartwout Fabricators, Inc., Kokomo, Ind. Called Lite-'n-Aire Heat Valve, it is said to be an efficient gravity type ventilator that incorporates Fiberglas com-

ponents to provide quantities of diffused natural light whether ventilator damper is open or closed.

The benefits of good ventilation plus skylighting are thus available in one economical unit, one roof opening, at one installation cost. Fibreglas components are strong, non-warping and resistant to weather and many chemicals. Used with automatic operating equipment and egg-crate grilles, these units are excellent for commercial, institutional and industrial installations, according to the company.

More information? Circle Item 66, postcard, last page.

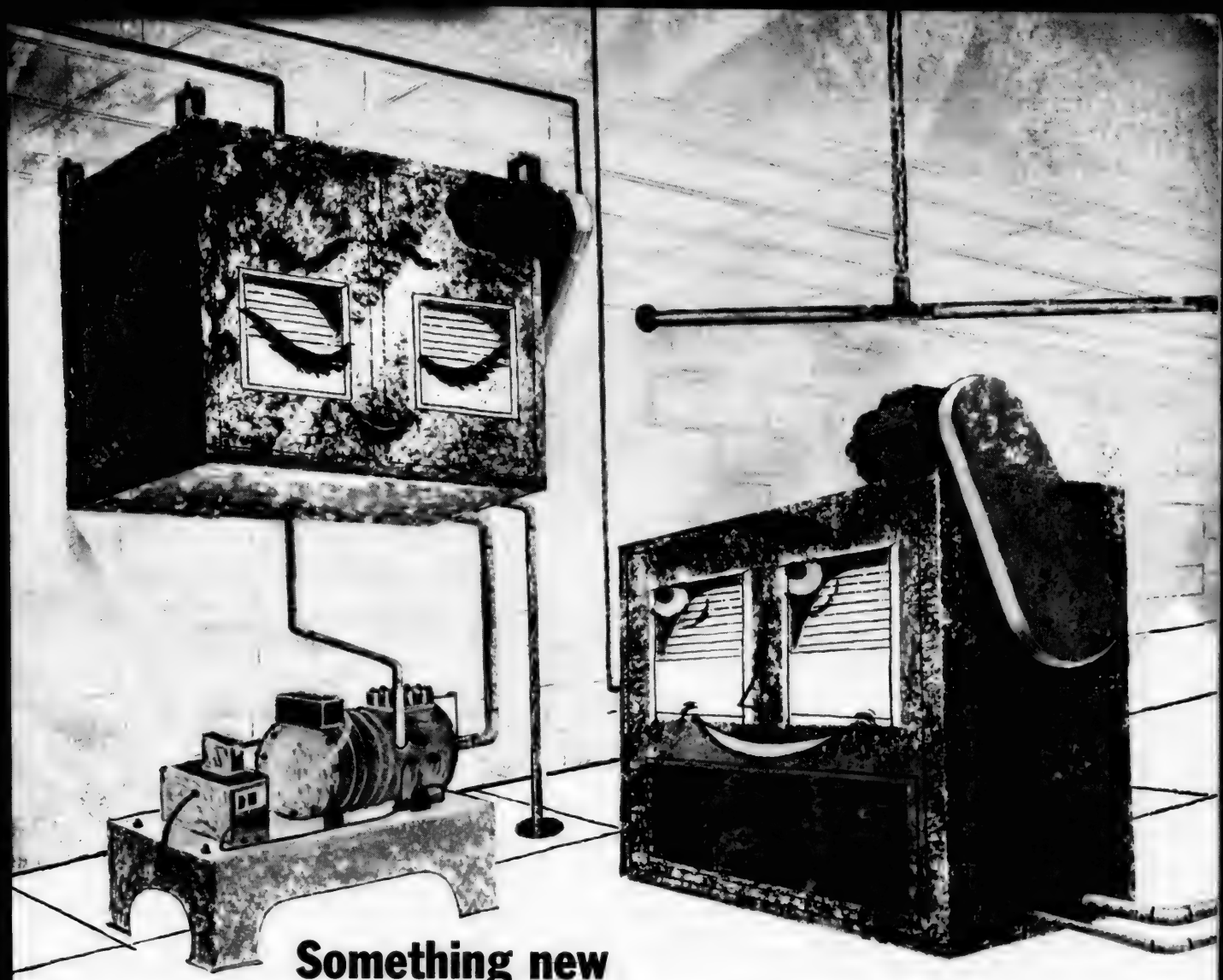
Eccentric Reducers for Welding

When its Husky line of welding fittings was introduced by Nibco Inc., Elkhart, Ind., it included 45 and 90 deg elbows, straight and reducing tees, and concentric reducers in a 2- through 6-inch range of sizes.

Now, the company announces, it has added eccentric style reducers and increased the size range to include 1, 1¼ and 1½-inch sizes. These fittings are also made from A-106 Grade B material, and meet the same ASTM A234 specifications as the older line.

More information? Circle Item 67, postcard, last page.

(Continued on page 114)



Something new for the air conditioning boys... and coils!

Now, Air Handlers from Halstead & Mitchell in 880 to 47,500 CFM Range

AH Series Air Handling Units

Before you buy any Air Handler, check and compare these new H&M units, feature for feature and price for price.

See how easily H&M Air Handlers accommodate matching cooling and heating coils, with space for up to 12 rows of coil depth overall! If you like, H&M coils (from 2 to 68 square feet of face area) can be factory-installed, leaving protruding connections on either side for easy hook-up. Halstead & Mitchell makes the coils you need to match: direct expansion, chilled water, hot water, standard or non-freeze steam. Filter sections are also available.

Performance? H&M Air Handlers deliver air against static loads up to 2-inches water gauge, and do it quietly.

Construction? They're the sturdiest units in the field. Forward curved centrifugal blowers are enclosed in a heavy gauge cabinet featuring formed steel corner posts and flush mounted panels.

Price? Just ask your H&M distributor. You'll be pleased. He has all the engineering information, too. Or, you can write for Bulletin AHU-100, Halstead & Mitchell, Bessemer Building, Pittsburgh, Pa.

HM

Halstead & Mitchell

Air Handlers • Finned Coils • Air-Cooled Condensers • Cooling Towers • Water-Cooled Condensers

(Continued from page 112)

All-Plastic Vacuum Breaker

Production of an all-plastic vacuum breaker for prevention of back-flow in water supply or other high-purity piping systems is announced by Tube Turns Plastics, Inc., Louisville, Ky.

The new product is injection-molded of unplasticized poylvinyl chloride and will be manufactured initially in ⅜, ½ and ¾ inch nominal pipe sizes. It makes available the corrosion-resistant, non-contaminating properties of UPVC for backflow prevention in applications such as pharmaceutical process lines, chemical and hospital

laboratory piping and sanitary plumbing, the company says.

The vacuum breaker incorporates an all-plastic movable disc, wholly within the unit, which moves up to close air vents and permit free flow of water or other liquid through the device, then seats itself in a vacuum-tight seal to prevent back siphonage when the flow stops. A removable cap protects air vents against exterior fouling.

According to the manufacturer, the unit is designed to meet state and municipal plumbing code requirements and also meets National Sanitation Foundation (NSF) requirements for potable water supply piping.

The UPVC vacuum breaker was tested for municipal code approval in a Midwestern city under vacuums up to 28 inches of mercury with no indication of back siphonage. It was approved for installation in a vertical position a minimum of 2½ inches above the overflow rim of the fixture (sink, etc.) it serves for the ½ and ⅜-inch sizes and of 7½ inches above the rim for the ¾-inch size.

More information? Circle Item 68, postcard, last page.

Control Ups Water Heater Capacity

An automatic control designed to provide adequate hot water even in peak periods when the water heater ordinarily would be taxed beyond capacity now is available from Grayson Controls Div., Robertshaw-Fulton Controls Co., Long Beach, Calif.

Model 200RB Unitrol features a simple dial for selection of hot water recovery speed. The set knob has three markings designating recovery speeds, and intermediate settings also may be selected.

Device is an adaptation of the 200R Unitrol, which incorporates a pressure regulator in combination with a thermostat. The range of outlet pressures for the new Speed Set control is designed to provide adjustable outlet rates of 2 to 5½-inch water column pressure, using city gas, on a water heater capable of satisfactory operation within these limits.

While temperatures are pre-set and remain constant, rotation of the dial speeds recovery time. The new control makes possible greater latitude in sizing of specially designed water heaters.

Temperature adjustments are indicated by markings on a retainer plate. The temperature adjustment screw and stop, in combination, are concealed under the dial.

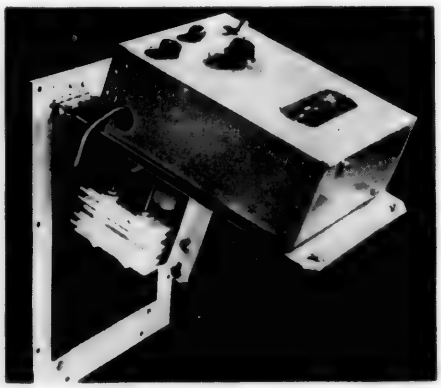
The new control cannot be interchanged with standard controls. It is intended only for use with water heaters specifically designed to operate satisfactorily within the 2 to 5½-inch water column pressure limits.

More information? Circle Item 69, postcard, last page.

Duct Ion Generators

Devices to produce negatively ionized air in ducts for distribution to residential, commercial and industrial spaces are manufactured by Vita-Aire Process Co., Inc., Milwaukee, Wis.

The machine uses ultra-violet rays to produce ozone, an unstable compound that releases a charged oxygen ion which rapidly combines with air impurities to oxidize and neutralize them.



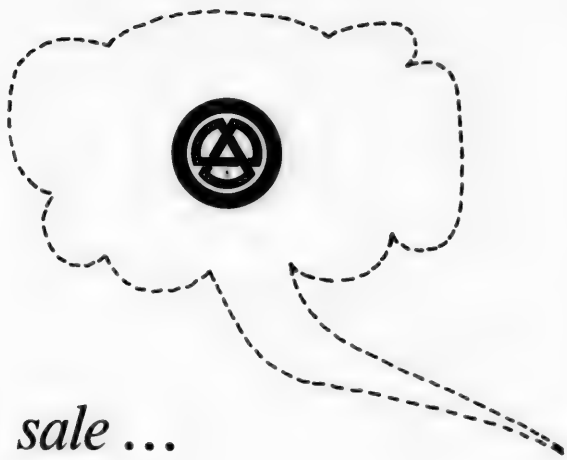
According to the manufacturer, the oxygen ions eliminate odors, combat mold, mildew, air-borne bacteria, and vermin in manufacturing plants, retail and wholesale outlets, food processing plants, service establishments, and the home.

A great many devices offered in the past, the company states, also produced ozone, but at the same time produced poisonous nitrous oxide. Vita-Aire units produce negative ions in any quantity desired and exclude the formation of other gases. They produce no sparks, do not arc, and no heat is generated.

In-duct units are available to handle air flows from 300 to 3,000 cfm. Many other types of units are also available that merely plug into a wall outlet and have a self-contained circulator.

More information? Circle Item 70, postcard, last page.

(Continued on page 116)



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This ARI Seal of Certification on unitary* air-conditioning equipment tells you—and your prospects—that it meets its published standards of performance.

With the ARI Seal on a unit, you can specify it with complete confidence. You know that the unit is built and backed by one of 46 companies who manufacture 90% of all unitary equipment sold. You know it is subject to intensive laboratory testing under adverse conditions and is rated to perform at maximum cooling capacity in the hottest, most humid weather.

ARI-certified equipment makes it easier for you on any job. It is easier to sell and to maintain. Once installed, you'll have fewer complaints from customers, fewer service calls, less repair and replacement expense—fewer headaches all around.

The ARI Seal of Certification on unitary equipment is an excellent sales closer. Put it to work for you next time you talk to a prospect.

*"Unitary" air conditioners included in this program: all packaged air conditioners, whether single units or two-piece units (called "split" systems) up to 135,000 B.T.U.'s per hour in capacity, but not including room air conditioners. ARI Standard 210-58 for electrically-driven equipment; ARI Standard 250-58 for heat-powered equipment.

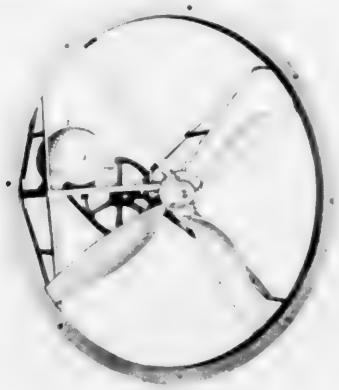
this seal helps you sell

For free explanatory booklet and Directory of participating manufacturers, write to: Chief Engineer, Dept. B-501, Air-Conditioning and Refrigeration Institute, 1346 Connecticut Avenue, N.W., Washington, D.C.

(Continued from page 114)

Low-Speed, High-Volume Fans

A series of low-speed, high-volume propeller-type fans is added to the line of industrial ventilating equipment manufactured by Hartzell Propeller Fan Co., Piqua, Ohio. These units offer efficiency and economy where large volumes of air must be moved by allowing the use of a single fan in place of several smaller units.



The series includes sizes from 65 to 94 inches in belt-drive, direct-drive or pulley-drive construction. The 94-inch, 26-hp model moves 174,000 cfm of free air or 157,000 cfm against ¼-inch static pressure.

Hubs and blades on these fans are aluminum alloy castings. Blade housings cast into the hub hold threaded blades which are locked into position at the desired blade angle setting by tension bolts. All hubs are statically balanced, and all blades are balanced against a master blade and are interchangeable.

More information? Circle Item 71, postcard, last page.

Fuel Cut-Out and Alarm Control

A boiler safety device announced by Reliance Gauge Column Co., Cleveland, Ohio, combines float action and electrode-operated functions in a common water chamber. Designated Levalarm EA-100P, it can be used in several ways: to provide fuel cut-out and low alarm, or dual fuel cut-out, or dual fuel cut-out and low alarm.

Float-action operates a sensitive switch, thrown open or closed through the medium of a permanent magnet and special armature. One or two electrodes, located at the opposite end of the device's body, serve to release fuel cut-out or actuate alarms by means of circuits isolated by small transformer-relay units.

The device permits piping economy where two, independently operated, fuel cut-out devices are needed, the company states, and is useful on boiler working steam pressures to 350 lb, or 650 psi in tank service.

More information? Circle Item 72, postcard, last page.

Pipe Joint Sealer in 4 Widths

Thred-Tape pipe joint sealer is now offered by Crane Packing Co., Morton Grove, Ill., in 4 convenient widths—¼, ½, ¾ and 1-inch—permitting selection of the size best suited to the joint to be sealed. This is in answer to the need for various widths due to the extreme range of pipe sizes used throughout industry. For example, it

is generally recommended that Thred-Tape be used as follows: ¼-inch width for pipe to ½ inch, ½-inch width for pipe from ½ to 2 inches, ¾-inch width for pipe from 2 to 4 inches, and 1-inch width for pipe 4 inches and over.

Made of chemically-inert DuPont Teflon, the pipe joint sealer has proved especially effective for handling the most destructive acids, caustics, corrosives, biologicals, toxics and gases. It withstands thousands of pounds of pressure, temperatures from −250 to +500 deg F, and can be used on all types of piping, the company reports.

More information? Circle Item 73, postcard, last page.

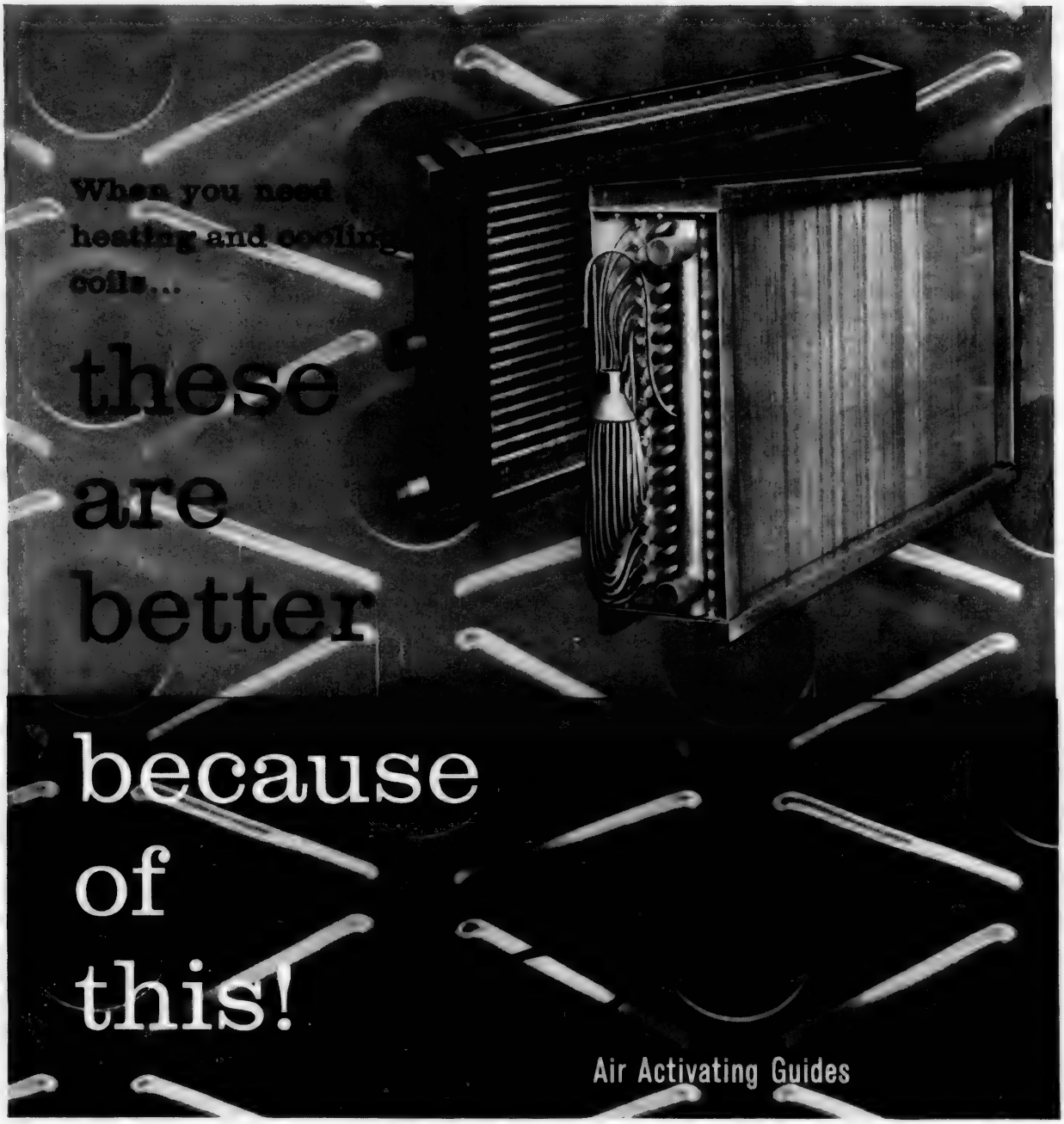
Low-Cost Thermometers

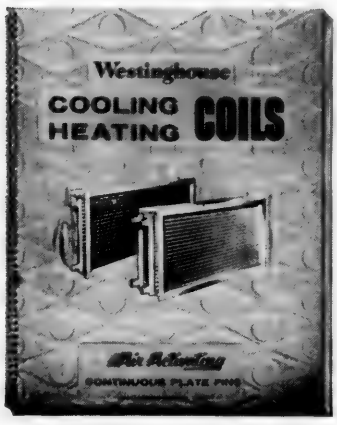
A new line of low-cost, precision thermometers, which accurately measure temperatures of hot and cold water lines, heater coils and similar processing and refinery equipment, is announced by H. O. Trerice Co., Detroit, Mich.

These economy thermometers are designed for use on refrigeration systems, hot water tanks and generators, oil burner pre-heating coils and other commercial and industrial circulating and storage systems requiring careful temperature maintenance. ½-inch N. P. T. brass separable sockets are provided for easy installation and unit replacement, and a 2-inch brass extension neck socket is offered for insulated lines. Thermometer cases are available in straight, regular angle, or oblique form.

More information? Circle Item 74, postcard, last page.

(Continued on page 118)





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Now! New Application Manual with complete data for consulting and designing engineers prepared in the format recommended by the Committee of 100 Prominent Consulting Engineers.

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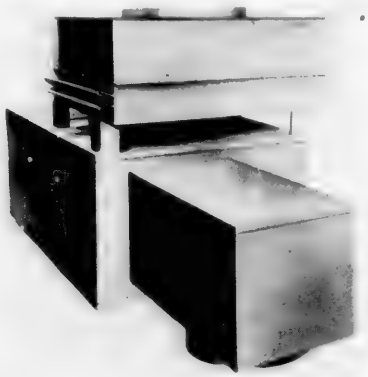
YOU CAN BE SURE...IF IT'S Westinghouse

(Continued from page 116)

10-Ton Roof-Mounted Conditioner

A 10-ton packaged air-cooled air conditioner and gas-fired heater combination, designed for roof-mounting, is introduced by Typhoon Air Conditioning Div., Hupp Corp., Brooklyn, N.Y. It offers a complete year-round system for commercial and industrial buildings with significant economies in installation, operation and maintenance, the company states.

Because unit is roof-mounted and air-cooled, it frees valuable floor space for selling or other operations and



eliminates all maintenance encountered with water towers, pumps and piping of water-cooled systems. The simple, gas-fired heating system providing 240,000 Btuh output is completely contained within the unit.

The 10-ton unit is in addition to an 8-ton unit introduced by Typhoon early in 1959. The new unit is particularly suitable for heating and cooling shopping center stores, supermarkets and similar one-story structures that require a simple, economically installed system.

The self-contained Typhoon roof-mounted unit consists of a cooling system, gas-fired heating unit, air filters, blowers and controls. All internal piping and wiring is done at the factory, leaving only fuel and electrical connections to be made in the field. An air distribution plenum and diffuser, to carry air to and from the building interior, is supplied with the unit.

According to the manufacturer, the new unit incorporates several major improvements on previous models of this type. It provides intake and discharge connections through the end. This permits placing the unit over weight-bearing building members—not necessarily over the space it serves—and running ductwork to the diffuser. Additional roof-support, often necessary with other roof-mounted units, is not normally required. Elimination of under-unit connections also permits easy, economical installation of flashing around ducts.

Compactness of the unit is another major advantage. It measures 90 by 60 inches, and is 80 inches high. Even weight distribution facilitates locating and installing the unit. It weighs 2750 lb.

The air-cooled condenser has a propeller type fan which discharges air vertically so its performance is not affected by wind velocity.

More information? Circle Item 75, postcard, last page.

Thermometers for Piping

Immersion type, vapor-actuated thermometers for piping installations, offered by Weksler Instruments Corp., Freeport, L. I., N. Y., are easy to read, dependable, and accurate throughout their entire working range, the manufacturer states. Further, they have progressively graduated scales for use in the upper two-thirds range, and economical construction with all-brass fittings.

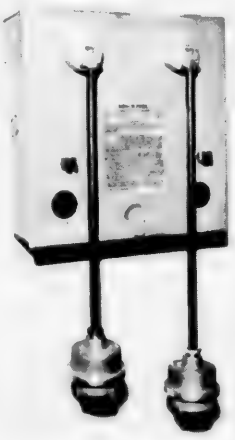
These gages are enclosed in black enameled cases with brass slip rings, furnished with brass separable socket, and an extension to clear insulation on covered lines or tanks. They are also available with small bulbs and up to 150 ft of uncompensated line.

Case design permits installation for adjustable angle, rigid or remote reading. Patented adjust-angle permits positioning of case or stem to any angle for ease of installation or for best angle of vision, by a simple adjustment of the stem lock nut.

More information? Circle Item 76, postcard, last page.

Package Alternator for Pumps

Designed to save time and expense when an alternator is needed to actuate two pumps, the compact Kenco-Trol, a fully wired, complete package alternator, is introduced by Kenco Pump Div., American Crucible Products Co., Lorain, Ohio.

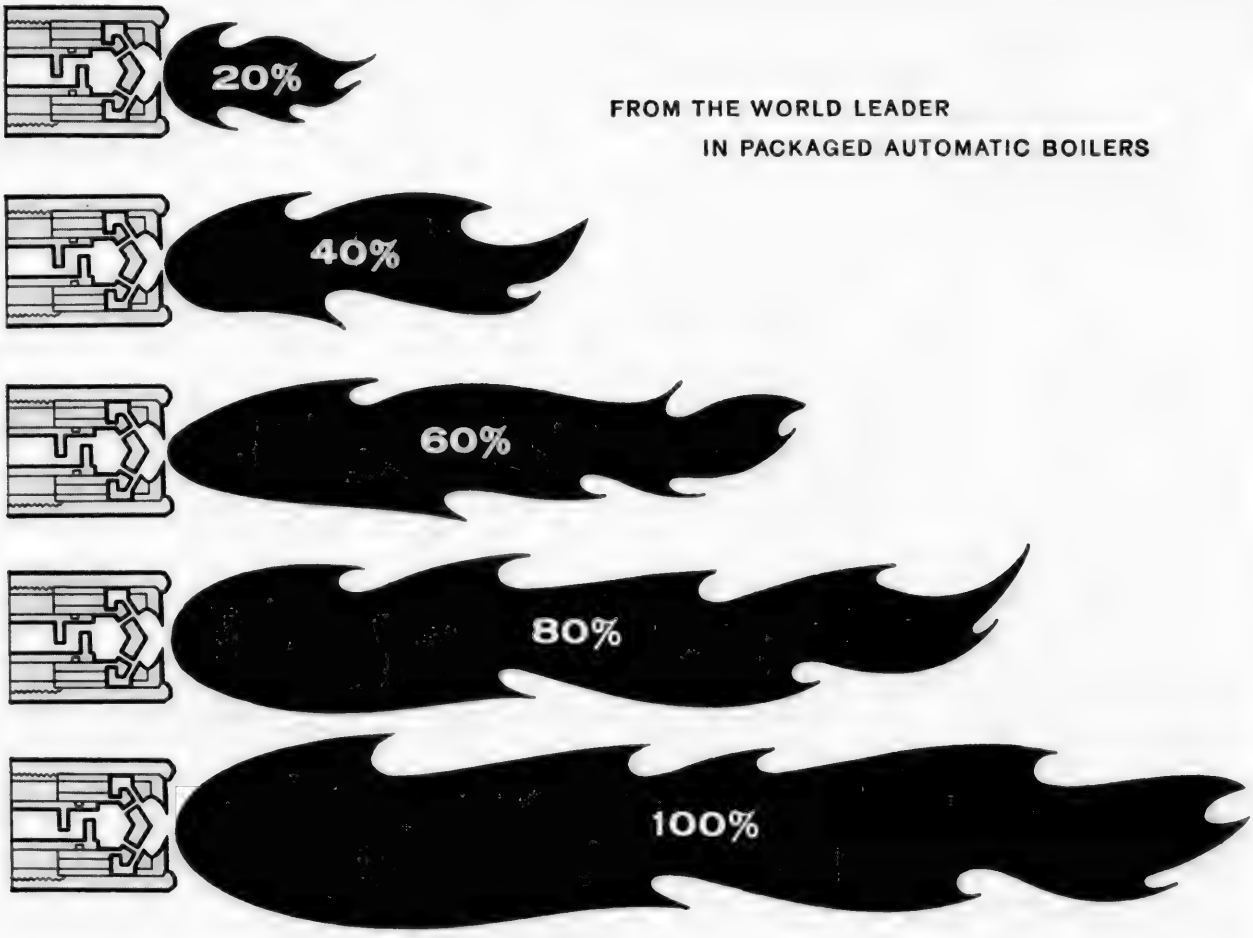


No on-the-job complicated wiring is necessary, the company reports. Simply connect the 115-v or 230-v power supply to Kenco-Trol, set two liquid level controls to the desired turn-on and turn-off points, and plug in the pumps.

Equipped with diaphragm-type liquid level controls, unit also does away with time-consuming adjustment of float controls. Combined with the company's submersible pumps, it further reduces maintenance and prevent critical breakdowns since there are no floats or exposed electrodes to foul up or corrode.

More information? Circle Item 77, postcard, last page.

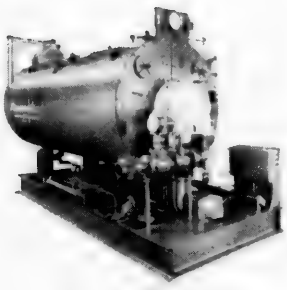
(Continued on page 120)



FROM THE WORLD LEADER
IN PACKAGED AUTOMATIC BOILERS

An O&S Exclusive: 5 to 1 TURNDOWN

Gives you equal efficiency from 20% to 100% of full firing rate or *any* load in between



For every firing load there is *one* right fuel/air mixture for proper combustion. Only *Powermaster* gives you this maximum efficiency because its exclusive modulating firing control delivers perfect fuel/air mixture *automatically* . . . at *any* firing rate.

This exclusive O&S feature is important to you for two reasons: 1. Operating efficiency is as high at 20% as at 100% and gives you impressive fuel savings at *all* firing rates; 2. Pressure or temperature is kept constant at *all* loads, resulting in more uniform process and in improved product quality. This feature is available in O&S oil, gas and combination burners for process, heating and hot water applications.

This exclusive feature is only one of the many reasons why you get more for your boiler dollar with *Powermaster*. For information on all *Powermaster* benefits, call your nearest O&S representative or write for Bulletin 1260.

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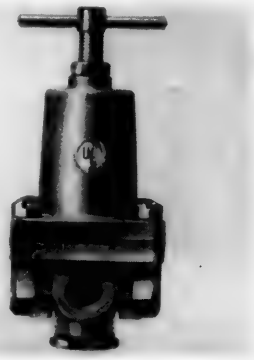
(Continued from page 118)

Low-Cost Pressure Regulators

Two new low-cost pressure regulators have been announced by Watts Regulator Co., Lawrence, Mass. Both are compact in design, and feature excellent flow capacity and accuracy, the company states.



Identical externally, the regulators differ internally, with Model 6 constructed of Underwriters Laboratories approved materials for LP gas and No. 7 of UL approved materials for acetylene gas.

Constructed of die-cast zinc with internal parts of brass and diaphragm and disc of oil-resistant Buna-N, both are available in ¼ inch size only. They may be used as 2, 3 or 4-way regulators.

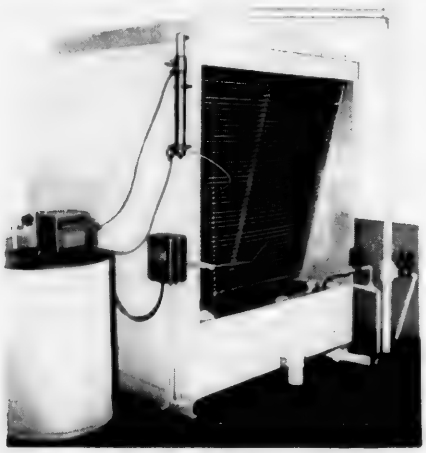
Watts' Industrial Division offers a comprehensive catalog featuring a broad range of pressure regulators for application to air, steam, water, LP gas, acetylene and some oils.

More information? Circle Item 78, postcard, last page.

New Type Treatment Feeder

Hydrotrol, a water treatment feeder and controller designed for use with recirculating cooling water systems to prevent corrosion, mineral scale, slime, and algae, is announced by Heller Laboratories, Inc., Leonia, N. J., a Carrier Corp. affiliate.

According to the manufacturer, it was developed to fill the need for a simplified, fool-proof, water treatment



device to protect refrigeration and air conditioning systems.

The system is said to eliminate drifts of treatment, that is, bleed-off and chemical feed are adjusted automatically so that the rate of feed and bleed-off are always in direct proportion to the rate of water evaporation or the cooling load on the system.

The result is said to be a 95% saving in water analyses, control labor, and attention required, plus large savings in chemicals and water.

More information? Circle Item 79, postcard, last page.

Wall-Hung Water Coolers

Addition of the On-A-Wall to its line of water coolers is announced by Kelvinator Water Coolers, Columbus, Ohio. The compact unit, mounted directly to the wall, may be set any distance from the floor. Its grey (Scandia pattern) plastic vinyl laminate finish is on 20-gage steel.

Front panel and grille is removable; mirror polished

stainless steel top has anti-splash ridge; wall protector back extends 3½ inches above the bottom of basin. Unit is provided with Dial-A-Drink bubbler and has a provision for a glass filler.

Coolers are available in both 7- and 13-gal capacities, and are also available in 18-8 gage stainless steel cabinets. Mounting bracket and template are provided. Accessories include: glass fillers, special masonry type wall hanger and special bracket for framed construction.

More information? Circle Item 80, postcard, last page.

Dual Switch Pressure Control

A dual switch, explosion-proof pressure control developed especially for pipelines, is offered by United Electric Controls Co., Watertown, Mass. The H98A is designed to meet the rigid requirements of the pipeline industry. It is said to incorporate excellent stability features, to maintain settings without drift, and to be mountable in any position without affecting calibration.

Two separate switches permit control of two independent circuits to simulate double pole circuitry. The calibrated adjustment is protected by a tamper proof cap. Also, pressure settings may be locked to avoid unauthorized tampering.

Several models are available with calibrated ranges between limits of 20 and 1700 psi, with proof pressures of 2500 psi and maximum pressures of 3500 psi.

More information? Circle Item 81, postcard, last page.

(Continued on page 122)

Whether by automobile or movement of gases and liquids by pipeline, today's trend in transportation is toward efficiency and economy. **HUSKY** steel welding fittings are designed to provide both. In fact, a welded system using **HUSKY** fittings can now be installed for no more than a threaded system. Or, looking at it another way, you can save as much as 85% per fitting over the welded fittings now in use! **HUSKY** fittings are ideal for all Schedule 40 piping and fully comply with A.S.T.M. A234 specification . . . perform admirably at much lower cost. ✻

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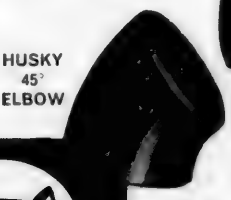
Husky fittings mean compact transportation, too!

HUSKY 90° ELBOW

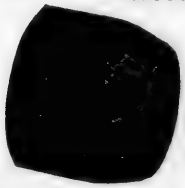
HUSKY REDUCING TEE

HUSKY STANDARD TEE

HUSKY ECCENTRIC REDUCER



HUSKY 45° ELBOW



HUSKY CONCENTRIC REDUCER

PMCIB MEMBER

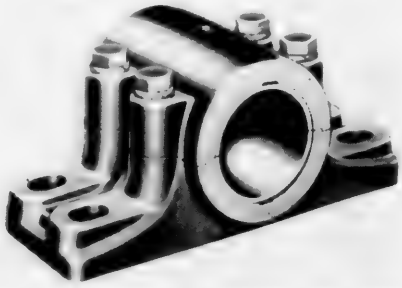
✻ Current jobs where **HUSKY FITTINGS** are being used include the following: **CANDLESTICK PARK STADIUM**, San Francisco, California; **JEFFERSON DAVIS HOSPITAL**, Houston, Texas; **WILLIAM WINLOCK MILLER HIGH SCHOOL**, Olympia, Washington; **MERCHANTS NATIONAL BANK AND TRUST COMPANY**, Indianapolis, Indiana; **CIVIL AERONAUTICS ADMINISTRATION CONTROL CENTER**, Fremont, California.

SEE NIBCO PRODUCTS BOOTH 401 NAPC SHOW, CLEVELAND JUNE 19-22

(Continued from page 120)

Pillow Block Easily Renewed

Bronze precision liners are said to be easily and quickly replaced in pillow blocks announced by Dodge Mfg. Corp., Mishawaka, Ind. The sleeve bearings are recommended for applications where shock loads, elevated



temperatures and corrosive conditions are anticipated.

For the first time, according to the manufacturer, it is possible to replace a worn bushing, or liner without removing the bottom half of the housing from its support. The change is accomplished simply: Only the cap of the block is removed. The shaft is lifted just enough to permit the lower half of the liner to be loosened and slipped out. A new bronze liner can then be inserted and seated by tapping lightly. The cap liner can also be replaced very easily.

More information? Circle Item 82, postcard, last page.

Gas-Fired Heater Line

A line of gas-fired heating equipment offered by The Trane Co., La Crosse, Wis., includes compact units of three types: propeller and blower unit heaters and duct heaters.

Heaters are said to provide a quick and efficient source of heat for commercial establishments, factories, warehouses, and other areas.

Propeller and blower heating units come in ten sizes from 30,000 to 250,000 Btu per hr input capacities. Duct heaters are available in six sizes from 60,000 to 250,000 Btu per hr input capacities.

All-welded, aluminized steel heat exchangers are readily removable for cleaning, have a unique Venturi shape to concentrate heat for better heat transfer, and lightweight burners to assure uniform supply of gas along the stainless steel ribbon port for proper combustion and concentration of heat in the exchange area. Individual burners may be quickly removed through the hinged bottom access door.

Gas-fired unit heaters are available with patented Louver-Fin air diffusers. These provide both vertical and horizontal control of air stream in free delivery applications. Distance of air throw can be increased up to 25% or fins can be set in any pattern to improve diffusion. Air stream can be diffused for gentle, widespread flow for close quarters or air stream can be split to discharge air in two separate streams allowing two areas to be blanketed at the same time. Ability to change air flow direction permits air to circulate in new areas without moving the heating unit.

Blower and propeller units are equipped with two highly sensitive limit controls. One delays operation of the fan until heat exchanger reaches correct temperature to avoid drafts on start-up. The other turns the fan off only after the last bit of heat has left the exchanger.

Duct heaters are also available with modulating main gas valves to maintain constant final temperature over a widely varying range of entering air temperatures.

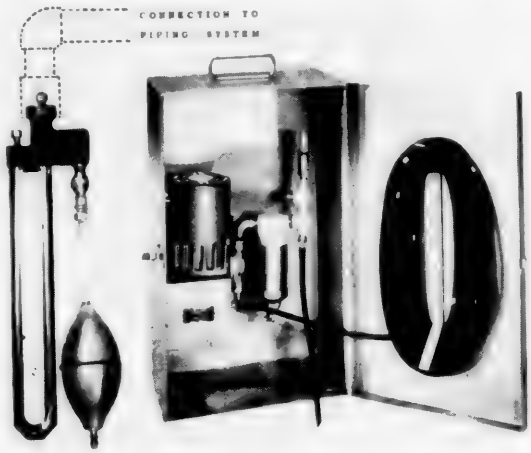
A control package is available as an accessory to provide automatic thermostatic control of heating. It permits continuous fan operation for summer ventilating, and provides manual shutoff and protection from overload and short circuits.

More information? Circle Item 83, postcard, last page.

Piping Leak Detector

De-Tekta-Leak, a product of the Combustion Div., Eclipse Fuel Engineering Co., Rockford, Ill., is a simple device said to make it easy to check for leaks in gas piping systems, refrigeration systems, and others.

It consists basically of a U-tube manometer with necessary connection fittings and a rubber bulb or small power-driven pump to build up pressure in the system.

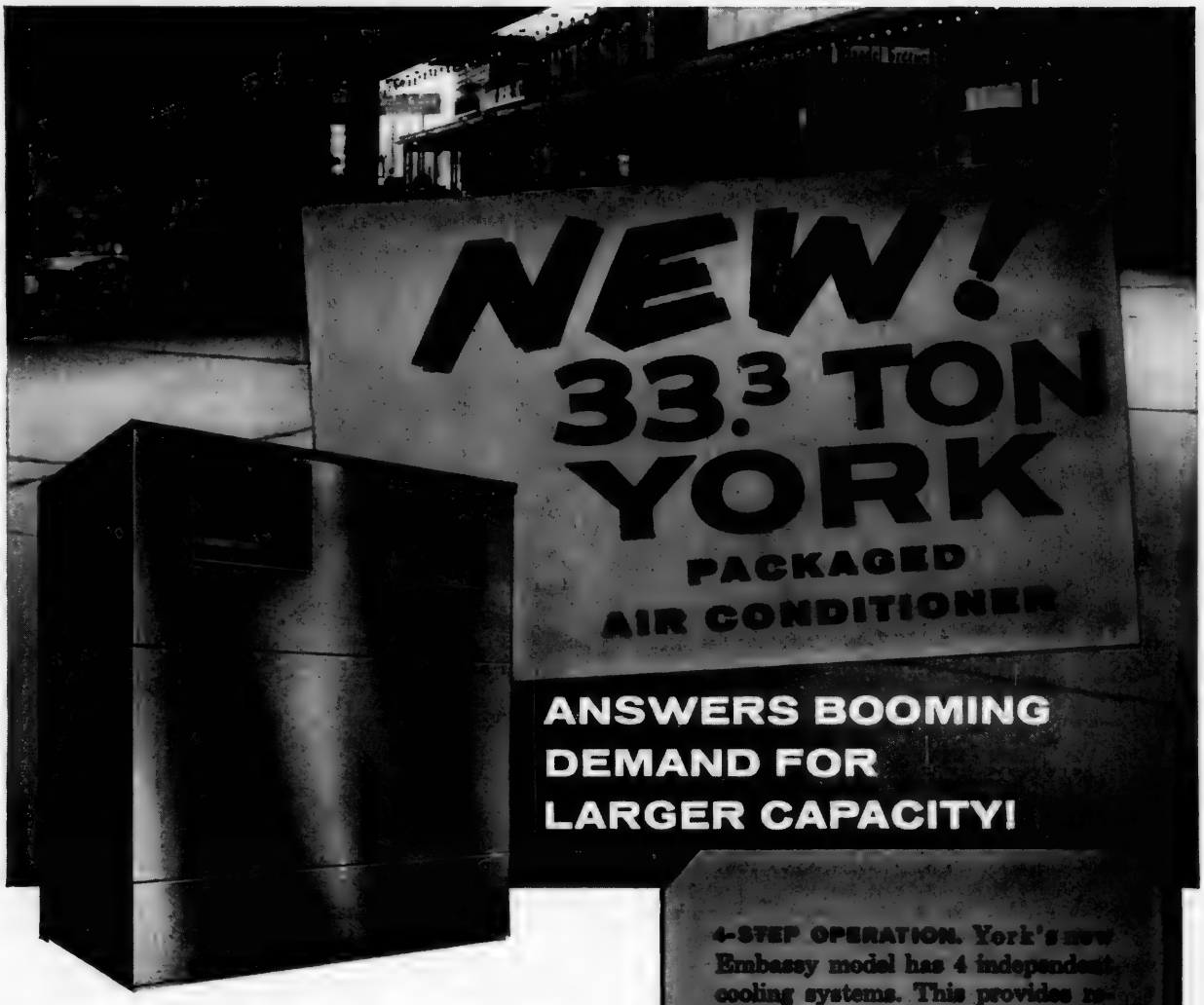


A leaktight shutoff cock is provided to seal off the system after it has been pumped up after which the manometer is watched to see if the indicated pressure is retained. Loss of pressure indicates a leak.

Needle valves are provided for preventing loss of fluid from the manometer when the instrument is not in use.

More information? Circle Item 84, postcard, last page.

(Continued on page 124)



ANSWERS BOOMING DEMAND FOR LARGER CAPACITY!

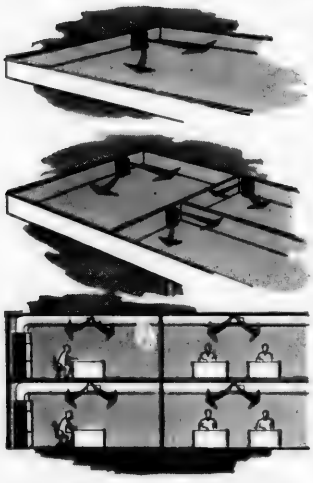
4-STEP OPERATION. York's new Embassy model has 4 independent cooling systems. This provides reserve systems which automatically swing into action on hottest days. Customer is able to maintain desired comfort level under varying load requirements...yet pays only for the cooling he needs.

50% MORE HUMIDITY REMOVAL. York's Exclusive Cooling Maze Coil forces air to twist, turn, and ricochet around staggered tubes and ripples fins. Excess moisture disappears.

MINIMUM INSTALLATION COST. Self-contained units can be installed anywhere. No need to [illegible] building or interrupt [illegible] ation. Additional units [illegible] as needed.

York Plant [illegible]
See Yo[illegible]

Easily Adapts to Any Cooling Need!



Zone Cooling
A single Embassy without ductwork easily cools large open areas.

Room by Room
Individual Embassys for large rooms. Central unit with ductwork for small rooms.

Floor by Floor
One or more Embassys on each floor with simple ductwork to partitioned areas.

Other Embassy Models from 3 to 25 ton capacity

YORK

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GRANTLEY ROAD, YORK, PENNSYLVANIA

BORG-WARNER RESEARCH & ENGINEERING MAKE IT BETTER

Air Conditioning, Heating, Refrigeration and Ice-Making Equipment • Products for Home, Commercial and Industrial Installations

(Continued from page 122)

Horizontal Air-Cooled Condensers

Horizontally mounted air-cooled condensers, which present a lower silhouette, offer less wind resistance and give a lower per-square-foot roof loading, are introduced by Acme Industries, Inc., Jackson, Mich.

The new models, designated AAVC and named Turbaire vertical-flow air-cooled condensers, are rated at 5 to 100 nominal tons capacity. Seventeen sizes are offered, with the larger sizes of 60 to 100 tons capacity being furnished as double units manifolded together.

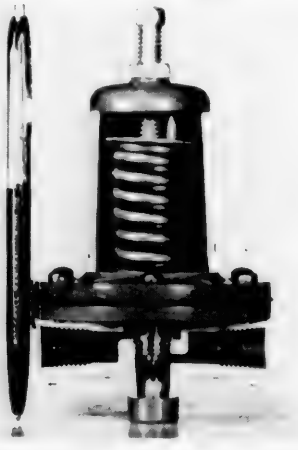
Company claims capacity ratings for the vertical-flow units are constant regardless of wind conditions, providing an extra degree of stability for the entire air conditioning or refrigeration system.

Quiet operation is achieved by the use of four-bladed deep-pitch fans; they are V-belt driven on permanently lubricated ball bearings on 1-inch shafts. They are mounted for vibration-proof operation.

More information? Circle Item 85, postcard, last page.

Versatile Instrument Regulator

Model 080 instrument regulator, applicable wherever a controlled supply of air or gas pressure is needed, has



been introduced by Meter and Valve Div., Rockwell Mfg. Co., Pittsburgh, Pa.

Said to be extremely versatile, it has a wide range of applications in commercial, industrial, and utility operations. It is especially suited for air supply lines for production line equipment, and in the plant or field its applications can vary from controlling inlet pressures on sensitive controlling, regulating, and recording devices to a first stage regulator for LPG systems.

Constructed of pressure die cast aluminum, the regulator has a maximum inlet pressure of 250 psi and outlet pressure ranges of 0-5, 5-35 and 35-100 psi. Optional construction includes a handwheel adjustment and a ¼-inch side outlet tap for pressure gage mounting.

More information? Circle Item 86, postcard, last page.

New Air Conditioning Tube

Introduction of ACR, a new copper tube expressly for refrigeration and air conditioning applications, has been announced by Wolverine Tube, Division of Calumet & Hecla, Inc., Detroit, Mich.

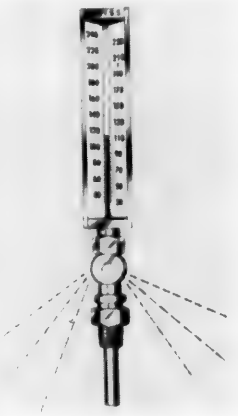
Wolverine ACR (Type L) is a cleaned and sealed tube available in 20-ft straight lengths in sizes ranging from ¼ inch nominal OD to 4 inches inclusive, and is ready for use by the refrigeration service engineer. It will be marketed on a national basis, through refrigeration and air-conditioning wholesalers.

Other features of this seamless tube include color coding with ACR markings indicating its primary use is for air-conditioning and refrigeration applications.

More information? Circle Item 87, postcard, last page.

Adjustable-Angle Thermometer

Albert A. Weiss & Son, Inc., Brooklyn, N. Y., announces its Vari-Angle thermometer which is quickly and easily adjustable to any angle for maximum visibility before, during or after installation. According to the manufacturer, this thermometer can be specified for almost any requirement where unusual angles are needed and hard-to-fit positions are found.



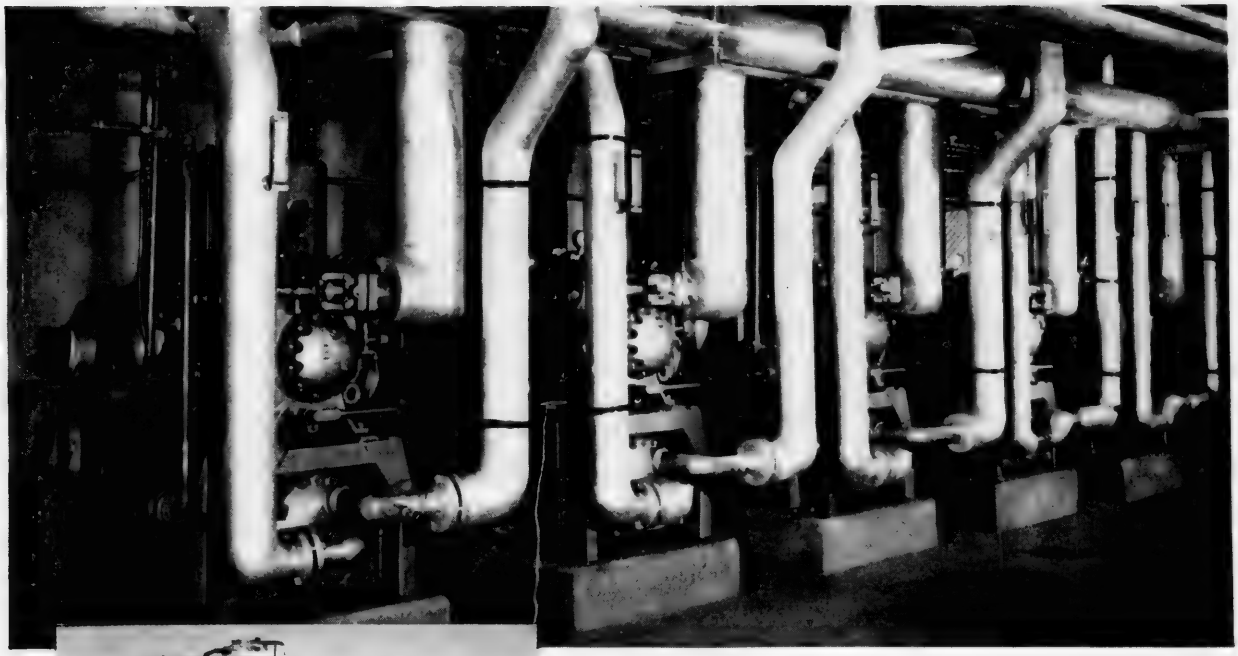
The entire adjustable portion of the thermometer is operated by a single hexagon jam nut which is easily accessible. A slight turn of the jam nut is sufficient to tighten or loosen the connection. The locking device is so designed as to provide a definite "bite" which securely holds the case at the desired angle and prevents its loosening from vibration.

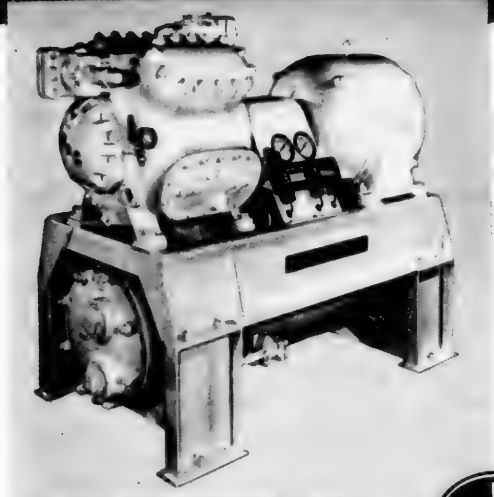
Air duct stems can be applied to the Vari-Angle thermometer, the company reports.

More information? Circle Item 88, postcard, last page.

(Continued on page 126)

B&G® CONDENSING UNITS SELECTED FOR KANKAKEE, ILLINOIS, STATE HOSPITAL





B&G CONDENSING UNIT
An achievement in design, featuring interchangeable vital parts. 7½ through 150 tons. Performs with effortless smoothness, but with rugged brute strength available when required.

This modern institution was constructed in 1959 under the direct control of the Division of Architects and Engineers of the State of Illinois. The consulting engineers for the mechanical equipment were E. R. Gritschke & Associates, Chicago, Illinois. Burge Ice Machine Co., Chicago, Illinois, made the installation. The B&G low temperature equipment selected to meet the exacting food preservation requirements of this installation was three 25 HP and two 20 HP low temperature Condensing Units.

The B&G Compressor is a notable advance in refrigeration engineering. It is distinguished by *quieter operation —less vibration!* All Compressors have *one* bore diameter —a few interchangeable parts will service all units, reducing maintenance problems.

Remember, too, that *all* major parts of B&G "package" units are made and guaranteed by Bell & Gossett Company. This "plus" design feature means greater dependability—greater value per dollar.

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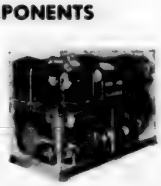
A COMPLETE LINE OF REFRIGERATION AND AIR CONDITIONING "PACKAGES" AND COMPONENTS

B&G Evaporators

B&G Centrifugal Pumps

B&G Condensers



B&G Package Liquid Coolers

(Continued from page 124)

Corrosion-Resistant Chlorinator

Development of its Series 3400 chlorinators, featuring the company's Stack Regulator, is announced by Fischer & Porter Co., Warminster, Pa. This design has been used successfully in previous models, but has here been extended to the entire chlorine control section, with a resulting increase in accuracy, safety and flexibility, the company states.

One basic model of the new line provides manual or automatic control over capacity ranges from 0.1 to 2000 lb per day. For complete protection against corrosion, units are housed in rigid, single-unit glass fiber cabinets. The two-tone beige color is an integral part of the cabinet, eliminating painting or other maintenance. All piping and working parts are likewise made of plastics or corrosion resistant alloys, insuring immunity to chlorine attack.

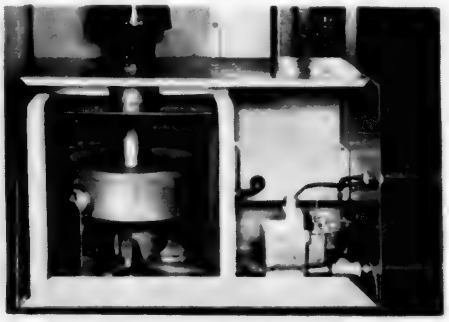
Controlomatic models of the new line accept electric, pneumatic, or vacuum signals from any type of metering device, and accurately feed chlorine according to proportional, start-stop, program, multiple rate, or residual control requirements. A unique valve permits visual observation of the rate valve.

More information? Circle Item 89, postcard, last page.

Gas-Fired Humidifier

A high capacity, gas fired humidifier for home and industry has been developed by Valley Mfg. Co., Valley, Nebraska.

Humidifier, called Valley/Aire, has a maximum capacity of 24 gal of water vapor in 24 hr. For commercial applications, several units can be used where higher capacities are needed. The company states that the unit



was developed to overcome the low-capacity deficiencies of present humidifiers, and that the unit would maintain up to 40% relative humidity in areas of 30,000-40,000 cu ft when outside temperatures register 0 deg F.

Unit measures 23 x 14 x 14 and attaches directly to a forced air heating unit. Water vapor is introduced directly into the warm air duct system on demand and only while the blower of the furnace is operating.

Unit consists of essentially four parts: (1) an easily maintained water system utilizing a float valve control, (2) a small gas heating system, (3) a system of controls providing 100% safety shutoff, and (4) a graduated humidity control to be located in the upper areas of the home or commercial business.

More information? Circle Item 90, postcard, last page.

Air-Flow Damper Regulator

A new air-flow damper regulator, called Duro-Trol, is introduced by Duro-Dyne Corp., Farmingdale, N. Y.

Designed specifically for installations in exposed areas where good appearance and ease of adjustment are of prime importance, this regulator can be installed on any new or existing system. Regulator shows the exact position of the damper. No tools are required for adjustment; turned by hand, the damper locks into position when the twisting knob is released.

Made of styrene, the regulator is impervious to dampness of dryness, heat or cold, the manufacturer states.

More information? Circle Item 91, postcard, last page.

System Head Pressure Regulator

A Wintermatic control system for use with its Dri-Con air-cooled condensers is announced by Recold Corp., Los Angeles, Calif.

The system is designed to regulate system head pressures during low ambient periods, preventing pressure from dropping below any desired minimum head pressure.

Basically, the system consists of two valves, an adjustable control valve and a balancing valve. The adjustable control acts as a pilot for the system and may be adjusted to maintain the minimum desired head pressure. As the pressure drops below this minimum, the balancing valve opens and gas will by-pass the air-cooled condenser, still maintaining the higher head pressure necessary to keep the compressor operating.

The pressure controls may be installed anywhere in the system, allowing flexibility of installation. They may be located near the compressor or receiver, in machine rooms, or at the condenser, if desired. No additional loops or traps other than normal are required in the piping. Control valves are especially desirable for multiple circuiting, as each circuit may have its own, individual control.

For extremely large capacities, two or more systems may be used in parallel on one condenser.

More information? Circle Item 92, postcard, last page.

(Continued on page 128)

only SPORLAN can offer you Peak Performance Solenoid Valves for Refrigerants, Water, Steam or Hot Gas Applications

with these...

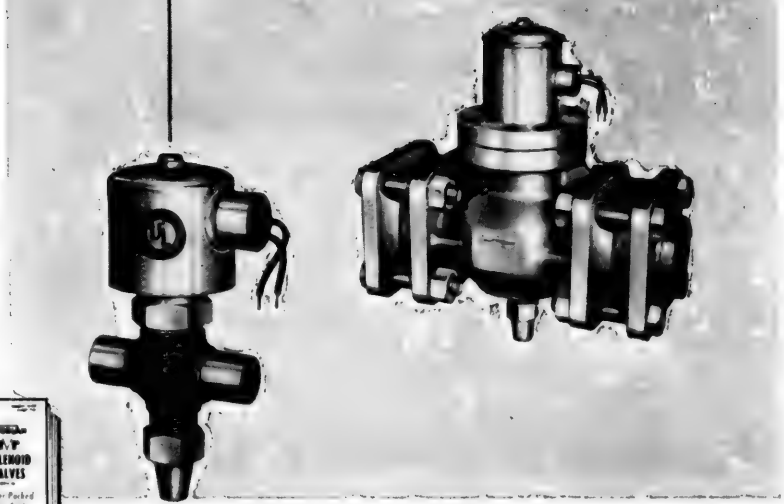
FAMOUS FIRSTS!

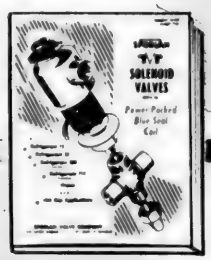
SYNTHETIC SEATING 1946

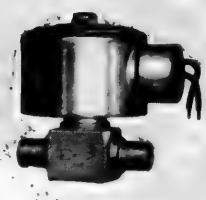
COLOR CODED LEAD WIRES 1955

PILOT CONTROL 1940

Sporlan's famous power packed Blue Seal Coils provide the valves with their high MOPD rating ...permitting the use of most valves for either Refrigerants 12 or 22







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SPORLAN VALVE COMPANY
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The most valuable instrument in the tool kit for the HEATING AND AIR CONDITIONING CONTRACTOR

Alnor PYROMETER

Registers temperatures accurately and instantly by simply touching the Pyrometer tip to any surface, or will register air temperatures at grilles, inside ducts etc. with the air temperature thermocouple tip.

Save time with quick positive readings, avoid trial and error methods, eliminate call backs.

With the Alnor Pyrometer you can—

- Set thermal expansion valve on cooling coils in less than a minute.
- Balance hot water systems right the first time.
- Get accurate readings on the effectiveness of insulation.
- Test temperatures of walls, floor, ceilings.
- Locate hot water pipes in cement floors.
- Use it any place where surface temperature readings are required.

Model 2300B. Has full 6 inch mirrored scale. Temperature range −40°F to 200°F. Complete unit in attractive durable case. Price $195.00.

Just tear out this ad and mail with your letterhead to

Alnor INSTRUMENTS

ILLINOIS TESTING LABORATORIES, Inc.
Room 570, 420 N. LaSalle St., Chicago 10, Ill.

(Continued from page 126)

Withstands Temperatures to 300 Deg

A special insulation envelope of coated Dacron for use on wires, cables, or pipes that are subjected to extreme hot spots is developed by The Zippertubing Co., Los Angeles, Calif.

The insulation envelope zips on in seconds, the company states, and only one man is required to do the job.

Envelope will withstand temperatures up to 300 deg F for a period of 100 hr or more, 400 to 450 deg for 10 min. (For higher temperatures, other materials are available.)

Developed initially for the missile and aircraft industries, the insulation envelope permits pipes to be handled easily, without danger, regardless of the temperature in the area. The envelope also protects cables and pipes from the deterioration caused by excessive heat. Envelopes come in all sizes and with whatever thickness of insulation is required.

More information? Circle Item 93, postcard, last page.

Door Seals and Insulates

A heavy-duty aluminum door, called Hot/Cold Door, designed to control temperature and humidity within rooms by insulating and sealing, is announced by American Shower Door Co., Inc., Hollywood, Calif.

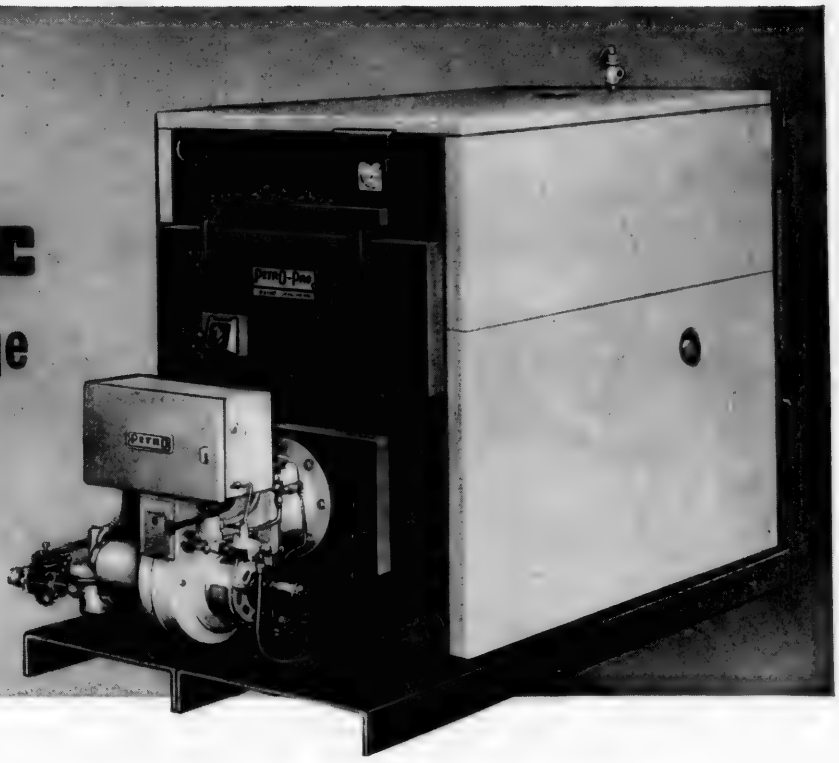
Described as attractive in appearance, the door can be used in steam rooms, laboratories, nurseries, florist shops, and any place where a special temperature or humidity must be retained.

Door is constructed of heavy-duty aluminum with clear wire glass opening or full length wire glass. Channel frame is heavy-gage aluminum and ⅛-inch aluminum sheeting pressure-set in a Neoprene channel. It is non-corrosive and impervious to moisture, completely insulated and weatherproofed around the jambs, the manufacturer reports.

More information? Circle Item 94, postcard, last page.

(Continued on page 130)

The PETRO PAC heating package has all of this



No base—low water line
Elimination of the boiler base required by the conventional square boiler reduces the height as much as 24 inches—in some cases much more. This leaves ample room for overhead piping even when ceiling height is limited. No pitting necessary.

Exhaust vent only—no stack needed
Forced draft firing is completely free of all natural draft problems. Exhaust vent can be as much as one third smaller than usual flue diameter, and no higher than is necessary to discharge combustion products away from buildings. No draft regulator needed (except with an excessively high stack).

Outstanding fuel economy—low standby loss
The Petro combustion system quickly achieves complete combustion even in a cold firebox. Heat absorption begins immediately. No delay while refractory comes up to temperature. No stored heat lost in refractory after burner stops. Sealed combustion reduces flow of heated air from furnace to vent during "off" periods.

Clean exhaust—no flame pulsation
Industry standards tolerate smoke during a 15 minute warmup. The Petro Pac produces a clean flame within seconds. This prevents air pollution and sharply cuts service costs, most of which are due to fouled combustion controls and sooted flues. Flame is steady—no pulsation. No hot surface is needed to "support combustion."

For gas, oil or dual-fuel firing
Petro Pac single fuel models are available for forced draft firing of either gas or oil. Dual-fuel models are especially desirable in areas where oil equipment is required as a standby for gas firing. Quick changeover is accomplished by a fuel selection switch.

Easy installation
Spot it where you want it; make service connections. No special skill required to install or operate. Petro Pac leaves the factory as a packaged unit. Fuel system, air system and operating controls are built in, factory wired and tested.

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MAKERS OF QUALITY HEATING AND POWER EQUIPMENT SINCE 1903

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3218 West 106th Street, Cleveland 11, Ohio
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Please send me literature and specifications on the Petro Pac packaged boiler.

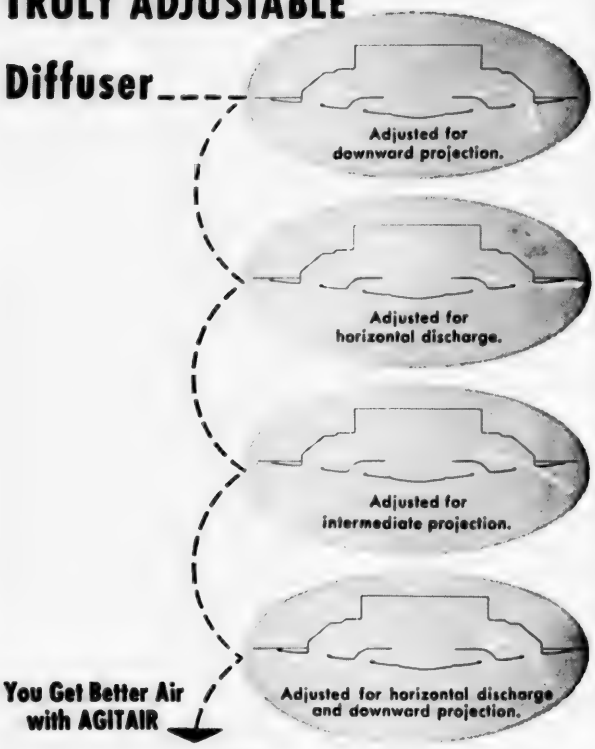
Name_____

Company_____

Address_____

City_____ Zone_____ State or Prov._____

Take a look at a TRULY ADJUSTABLE Diffuser---


Adjusted for downward projection.
Adjusted for horizontal discharge.
Adjusted for intermediate projection.
Adjusted for horizontal discharge and downward projection.
You Get Better Air with AGITAIR

AGITAIR®
TYPE "OA"

Here's a distinctively different diffuser with a radically new means of controlling air direction at four different angles of discharge simultaneously. *Without changing the position of the spinnings,* AGITAIR "OA" diffusers can be adjusted to put the air where you want it in one, two, three or four directions . . . *after installation.* Result: Segmentized . . . positive adjustability with Finger-Tip Air Direction Control.

Write for Bulletin C-101

Contains complete data, performance charts, construction details, etc.

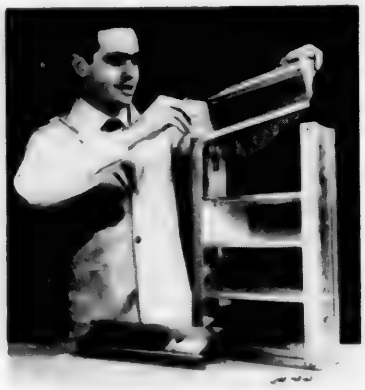
AIR DEVICES INC.
185 MADISON AVENUE, NEW YORK 16, N. Y.
AIR DIFFUSERS • FILTERS • EXHAUSTERS

(Continued from page 128)

Aluminum Ventilating Louvers

A new line of fixed and adjustable aluminum ventilating louvers, featuring interchangeable parts and outstanding simplicity of assembly, is introduced by Walcon Corp., Ecorse, Mich.

Slated for use in applications ranging from quality



residential to heavy industrial, the new louvers are available in standard sizes, ranging up to 12-ft heights and 5-ft widths. They are produced from heavy-duty, 0.063-inch aluminum sheet, supplied by Aluminum Company of America.

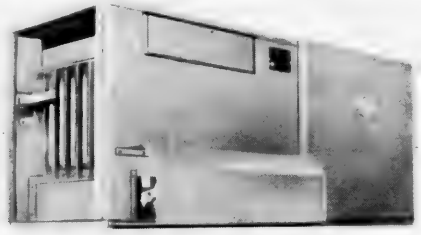
Because all parts of the louver are interchangeable, single damaged sections may be replaced without having to destroy the complete unit, according to the producers. Bird screening will be available, either for inside or outside surfaces. No welding is needed; only eight aluminum screws hold the unit together.

More information? Circle Item 95, postcard, last page.

Horizontal Gas-Fired Unit

A new horizontal gas-fired unit is added to the Air-ease line of heating and cooling equipment manufactured by The Johnson Furnace Co., Cleveland, Ohio. The unit features flexibility in that the burner and draft diverter can be installed on either side, the company announces.

This permits air flow from left to right or right to left,



with vent horizontal or vertical at the front or at the rear of the unit. Capacities of the NMS units are from 70,000 to 140,000 Btu per hr input

More information? Circle Item 96, postcard, last page.

(Continued on page 132)

For Your Protection

SPECIFY • INSTALL

ALCO
SOLENOID VALVES
FOR POSITIVE CONTROL

ALCO'S HIGH QUALITY
Guarantees Maximum Life

- Constructed both for hermatic and non-hermatic applications
- Manufactured of the best grades of corrosion-resistant materials
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More than **125** models for every control application:

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HOT GAS • WATER
STEAM • AIR

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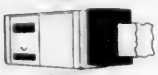
The one complete line of refrigerant controls: Thermostatic Expansion Valves • Refrigerant Distributors Solenoid Valves • Suction Line Regulators • Flooded Evaporator Controls and Reversing Valves

Every Home
is a prospect
for a low-cost
Health-Air®

Here's Your Chance to Get Into a Huge Rich Market Ahead of Competition!

Side Mounted Base Flow

Top Mounted Counter Flow



Ceiling Mounted Horizontal Flow

Now, for the first time, you can sell and install a really practical electronic air cleaner at a high volume price. Health-Air has no peer in the field today. A 3-stage unit (mechanical filter for large particles, electrostatic filter for fine particles and charcoal filter for smells, gases, smoke, etc.) which can be installed in the return side of a furnace or air conditioner for heating or cooling before recirculation. Every household is a prospect. Saves on heating bills, keeps air in homes clean and pure. Wonderful relief for hay-fever or allergy sufferers.

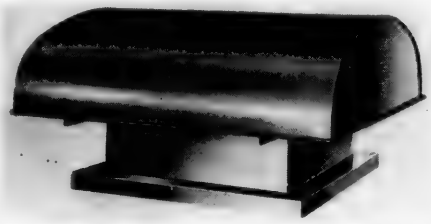
Write today for all the facts.

MAMCO
CORPORATION
ELECTRONIC DIVISION / RACINE, WISCONSIN

(Continued from page 130)

Multi-Use Roof Ventilators

Western Engineering & Mfg. Co., Los Angeles, Calif., announces a new line of low silhouette roof ventilators, known as the Transaire series. Multiple applications are offered, such as relief, gravity, intake, power exhaust, and power supply. Powered units are offered in belt-driven or service-free direct drive.

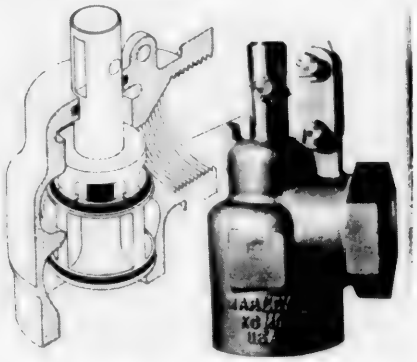


One of the main features, the company reports, is the standardized housing which provides continuity and attractiveness of roof appearance, although each unit may be performing a different function.

More information? Circle Item 97, postcard, last page.

Non-Sticking Float Valve

The DA (direct action) float valve marketed by The Marley Co., Kansas City, Mo., boasts mechanical simplicity, operational dependability and maintenance ease. The manufacturer states that only a pair of pliers is needed for any maintenance job.



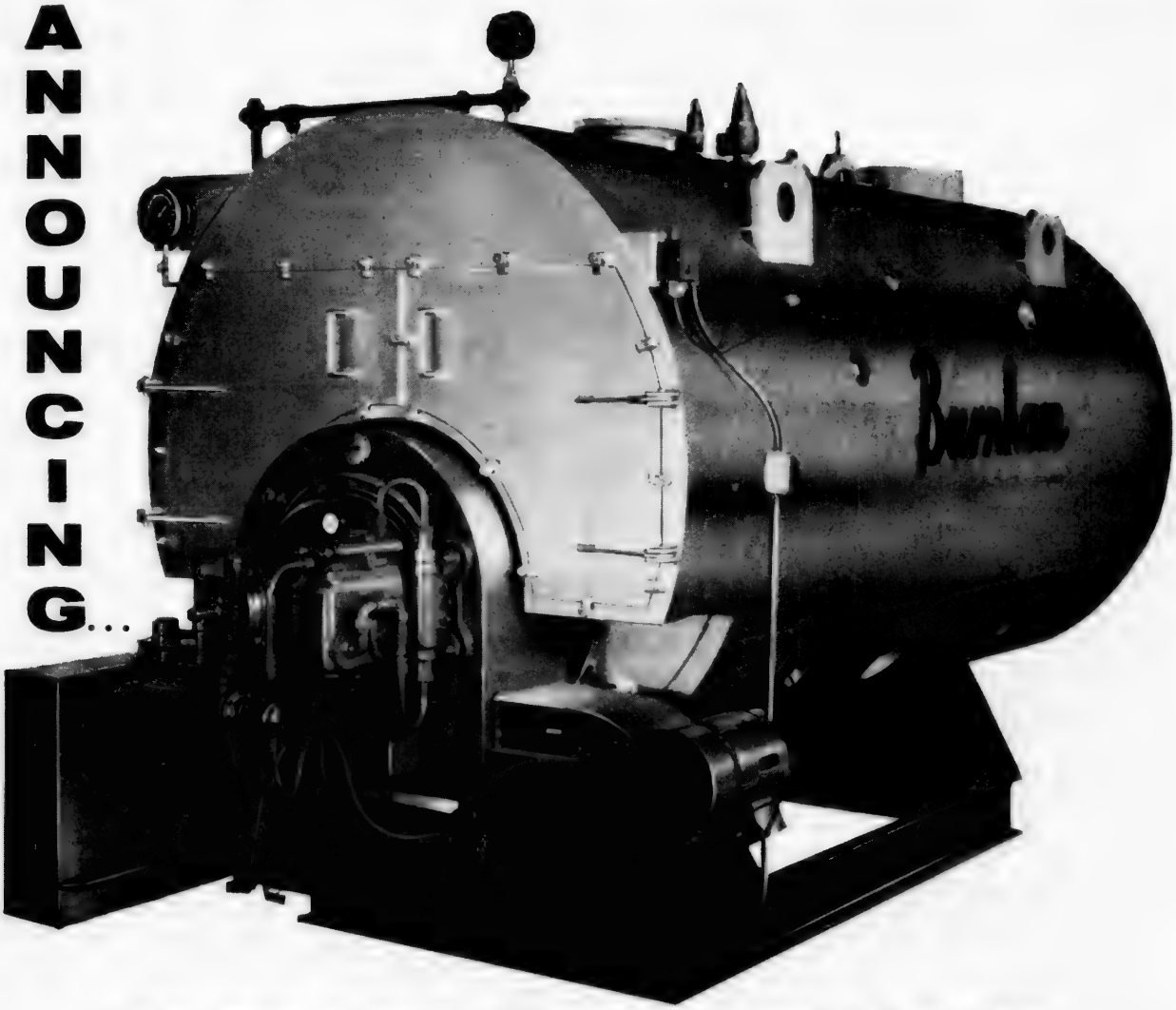
Valve has only two basic parts—body and plug, as illustrated. Plug and stem are cast as an integral unit. The body, also cast as a unit, has a threaded inlet opening and the outlet opening can be threaded if desired. O-rings, utilized to form stem seal and plug seats, cannot be fouled or stuck by foreign matter in the water, it is said. There are no packing glands, packing nuts, cup leathers, seat discs, ground or threaded parts.

Non-corrosive metals are used throughout: bronze castings, float rod and cotter keys, brass pivot pins, brass and stainless steel screw fasteners. Floats are either Tenite plastic or copper.

More information? Circle Item 98, postcard, last page.

(Continued on page 134)

ANNOUNCING...



THE NEW BURNHAM 3-PASS SCOTCH-TYPE PACKAGED STEEL BOILER

Here's a high point in efficient, low maintenance heating for schools, office buildings, all commercial and institutional installations! Designed to the latest SBI ratings for Scotch-Type 3-pass low pressure installations, these modern new boilers have certified efficiencies of better than 80%. Flue gas temperatures are in the 400° to 450° range. Perfectly balanced draft conditions between the second and third passes, help make these units outstanding performers. They are available as bare boilers or as complete boiler-burner packages for oil, gas or oil/gas combination firing. Sizes range from 20 to 800 hp. new five sq. ft. fireside heating surface ratings per hp. Write for full details now.

Also available for prompt shipment:
Scotch-Type 2-pass boilers; Compact-Type Table 1 and Table 2 steel boilers.

Burnham Corporation

Steel Boiler Department
Irvington, New York

MEMBER SBI

Sales Representatives throughout the U. S. A.

Burnham Corporation ACH-50
Steel Boiler Department
Irvington, New York

Please send me, without obligation, full ratings and data on:

☐ Scotch-Type 3-pass Boilers ☐ Compact Boilers
☐ Scotch-Type 2-pass Boilers ☐ Boiler-Burner Packages

Name .....

Address .....

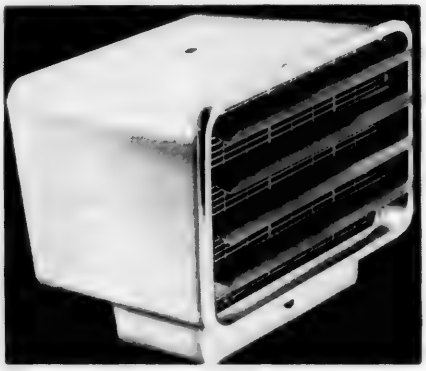
City ..... State .....

(Continued from page 132)

Electric Unit Heaters

Called a new concept in electric unit heater design and construction, Series UH unit heaters have a clean, modern appearance. The manufacturer, Berko Electric Manufacturing Corp., Queens Village, N. Y., sees this as permitting their use in offices, reception rooms and stores where design and decor are important factors and where unit heaters could not previously be considered because of their large size and "industrial" appearance.

These units, constructed for heavy-duty use, have $\frac{5}{8}$-



inch stainless steel sheath type heating elements which are totally enclosed and non-glowing. Use of a factory-wired, built-in 30-amp contactor (relay) eliminates the need for remote contactors and costly external wiring, the company reports.

A thermal safety cut-out provides protection against overheating due to over-voltage, motor failure, or other causes. The unit heaters, available in 5 and 7.5-kw capacities, 208, 240 and 480 volts, boast chassis-type construction which permits the entire internal components to be removed as a single unit for cleaning or servicing without disturbing the heater and external wiring.

More information? Circle Item 99, postcard, last page.

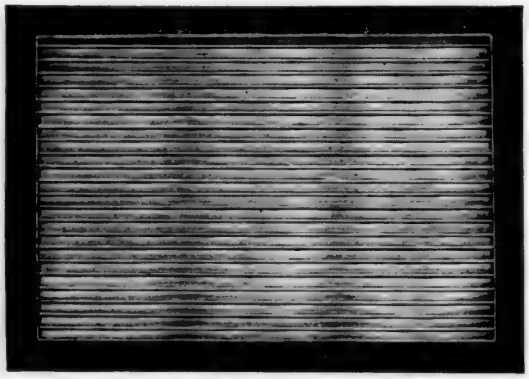
Conductivity Controller

An automatic cycling multipoint conductivity controller for monitoring purity of return steam condensate at up to twelve separate points on a single instrument is announced by Industrial Instruments, Inc., Cedar Grove, N. J.

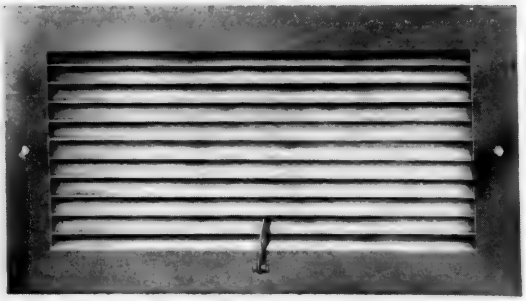
An alarm condition at any station is indicated by the lighting of the appropriate red signal light. Designated ARPT-315KA, this instrument is also used to check the contamination of demineralized water in rinsing operations. Suitable for wall or flush mounting, the unit is complete in itself, requiring no auxiliary controller.

More information? Circle Item 100, postcard, last page.

(Continued on page 136)



No. A-760-B All Aluminum, No-Vision Grille



No. A-76-B All Aluminum, Shut-Off Type, No-Vision Grille

A-J

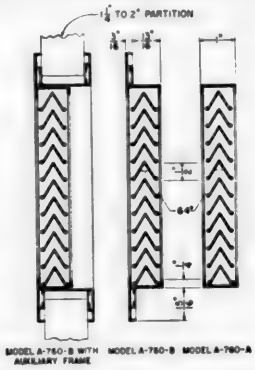
Dept. V-5

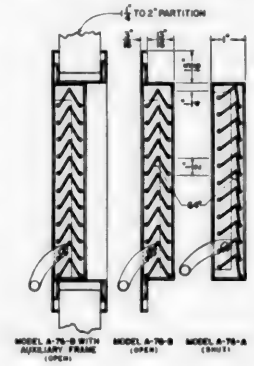
A-J NO-VISION ALL ALUMINUM GRILLES

Fixed and Shut-Off Types

ALL NEW! The A-J No. A-760 and A-76 Series no-vision grilles, being only 13/16" thick, have no bulky depth to extend beyond door thickness. Excellent for duct installation for supply and return air. Louvers are on ½" centers, and are completely sightproof from any angle. Free area is approximately 48%. Corrosion and rust-proof. Requires no upkeep. Satin finish is standard.

Write for new 1960 FREE catalog!

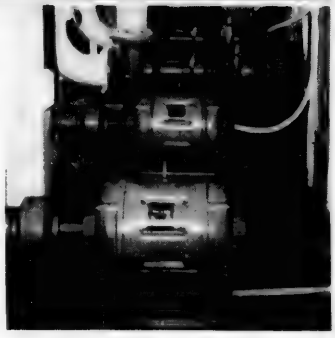




A-J Manufacturing Co.

3601 East 18th Street Kansas City 27, Missouri

Home Security Life Insurance Company Building, Durham, N.C., is equipped with B&G Universal Pumps. "The pumps couldn't be any quieter," says the plant engineer.



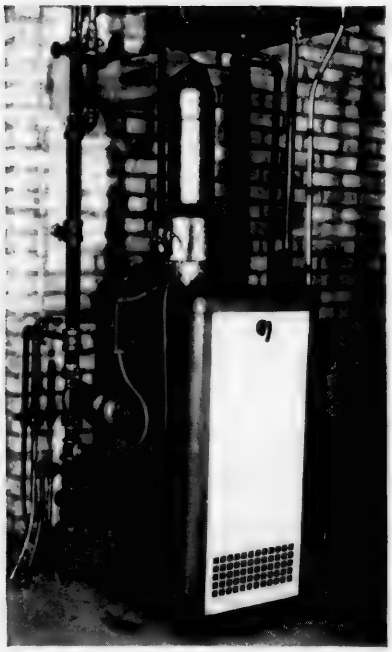
B&G® BOOSTER AND UNIVERSAL PUMPS

quiet... where silence counts

Whether for residential or commercial applications of a forced hot water system, *quiet* operation of the circulating equipment is essential. A noise-creating pump can be a headache and a profit-wrecker for all concerned—architect, engineer, contractor and owner. That's why men responsible for pump selection are concentrating on B&G Boosters and Universals—for the simple reason that they will not be plagued later with noise complaints.

Since the manufacture of its first heating pump, B&G has been conscious of the need for silent, vibrationless operation. Today, B&G pumps have reached a peak of perfection—they are incredibly quiet—need no flexible connections or vibration eliminators. From B&G-built motors to B&G-developed, harder-than-glass "Remite" leak-proof seals, these pumps are *specialized* units.

B&G Boosters and Universal Pumps are available in a wide range of capacities with 1/12 to 40 H.P. motors.



The comforts of B&G Hydro-Flo Heating are obtained from a unit smaller than a refrigerator.

These homes have modern Hydro-Flo hot water (hydronic) heating systems equipped with B&G Booster Pumps. Builder reports that the many exclusive advantages of B&G Hydro-Flo Heating helped sell these homes fast.

Send for Catalog of B&G Hydro-Flo Products

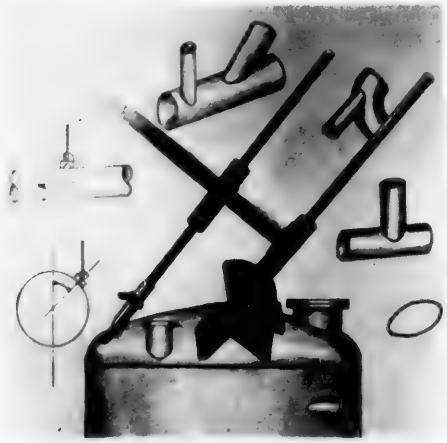
BELL & GOSSETT
COMPANY
Dept. GE-4, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

(Continued from page 134)

Pipe Marker Simplifies Drafting

A pipe marking tool said to eliminate the need for template drawings and to reduce shop handling time is announced by Sury Products Co., Cleveland, Ohio. According to the manufacturer, it quickly and accurately draws projections directly, at any angle, onto any working surface without the aid of projection drawings.



The marker scribes ellipses ranging from 2½ to 3-inch minimum diameter to a 12 to 16-inch maximum diameter, depending on angle desired. Lateral and header markings for angles from 0° to 45° are easily made. Marker operates equally well on flat or multiple-curved surfaces, accomplishing in minutes what ordinarily would take hours of preparation time, the company states.

For marking metal surfaces, the Marker is equipped with a soapstone tip. This tip can be replaced with a ¼-inch pencil for marking plastic, paper or other non-metal materials.

More information? Circle Item 101, postcard, last page.

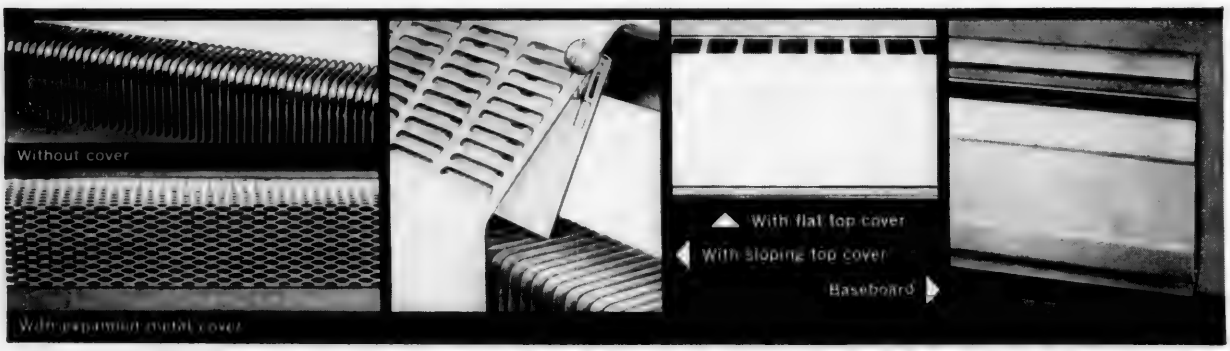
Hermetic Motors Improved

A new kind of overload protection for hermetic motors used in large air conditioning systems has been announced by General Electric Co., Schenectady, N. Y. Tradenamed Thermo-Tector, the simple, fast-acting protection system is available on all the company's Tri-Clad '55 hermetic three-phase induction motors, 30 to 250 hp.

Protection is provided by two or more miniature heat-sensing switches buried in the stator windings. The switches, connected in series with conventional motor control, shut the motor off whenever internal winding temperature exceeds a predetermined amount regardless of rate of temperature rise.

More information? Circle Item 102, postcard, last page.

(Concluded on page 138)



32 different copper and steel heater elements to choose from in the complete SARCOFIN line.

Choose the finned tube radiation that best meets your requirements—from the complete Sarcofin line. Choice of 32 different heating elements. Eight types of enclosures: flat-top, expanded metal, sloping top, modified flat top, sill-type and three baseboard cover types.

And for old or new homes, remember the variety, flexibility, and easy installation of Sarco-Pak baseboard radiation.

All ratings are approved under the I-B-R code. For your extra convenience, standard length "packages" are now available. Superb appearance matches high Sarco quality.

You always get the advantage of single-source responsibility, when you specify Sarco-Sarcotherm for all your finned-tube radiation, heating specialties, pumps, regulators, and weather-compensated control systems. Write for your copies of latest bulletins on Finned-Tube Commercial Radiation and Baseboard Radiation. 2363

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

UARY–1990

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		1
6		8
13		15
20		22
27		29

SHOWERING COMFORT AND SAFETY FROM LAWLER SO FAR ADVANCED IT WILL NEVER GO OUT OF STYLE!

Recesso

The **Recesso's** "years ahead" styling leads the industry in thermostatic shower mixers. The **Recesso** is entirely recessed into the wall . . . eliminates dangerous protruding edges which might cause bodily injury or collect unsanitary dirt, grime and soap scum.

Lawler's advanced thermostatic element gives the **Recesso** new sensitivity and instant action for truly safe, comfortable showering. Your customers will enjoy the beauty and safety features of the **Recesso** years from now!

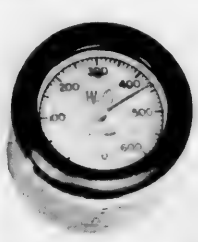
FOR TIMELESS PERFORMANCE STANDARDS LOOK TO LAWLER . . . FIRST!

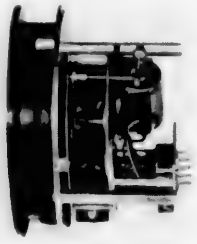
LAWLER AUTOMATIC CONTROLS INC., MT. VERNON, N.Y.

(Concluded from page 136)

All-Electric Remote Receiver

An all-electric round dial remote receiver, Model 731, for remote indication of gas and liquid pressure, draft, differential pressure, flow, temperature, and liquid level is available from The Hays Corp., Michigan City, Ind.

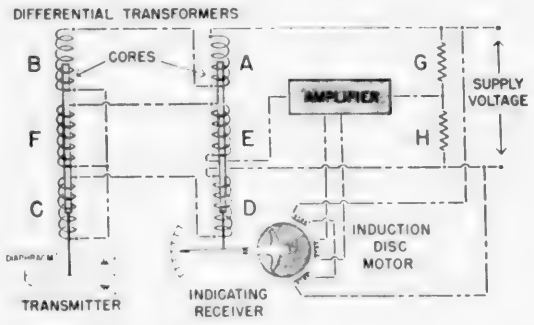




By utilizing remote electric transmission, the danger of high pressure and temperature lines at panel boards is eliminated and impulse piping requirements are reduced to the short length needed between point of measurement and the transmitter, the company states.

Great speed of response (2.5 sec for full scale travel or better) is possible in the receiver because of its all-electric and electronic operation, reports the manufacturer.

The new electric remote receiver becomes one of the company's series of instruments which utilize its remote



electric transmitters. There is a wide variety of such transmitters available, in various ranges and styles.

A three-wire transmission line is all that is required between the transmitter and the new receiver. A plug-in connector to the amplifier is its only external connection. Power supply to the amplifier is 115 v, 60 cycle, single phase, a-c, with a power consumption of 50 watts. Transmitter power supply originates from the amplifier. See schematic diagram of remote transmission system, above.

Sensitivity of the new receiver is described by Hays as 0.1% of full range or better, with calibrated accuracy for flow being ± 1% of full range scale. Three sizes to fit most requirements are offered.

More information? Circle Item 103, postcard, last page.

You'll Get More Hot Water, FASTER

WITH A EWING AUTOMATIC HEAVY DUTY VERTICAL HOT WATER HEATER

and for **LESS COST** *because:—*

USES ANY TYPE GAS

Ewing

—requires no expensive storage boilers!
—is so simple and easy to install and operate!
—is fool-proof and trouble-free; no maintenance!
—saves valuable floor space; is so compact!

UP TO 850 GALLONS PER HOUR AT 100° TEMPERATURE RISE

Storage capacities from 50 to 226 gallons. Every Ewing heater is superbly engineered and registered with the National Board of Boiler and Pressure Inspectors. All safety controls listed by AGA.

Ewing heaters are ideal for a multitude of purposes where constant supplies of clean hot water are needed. Laundries, cafes, clinics, apartment houses, motels, etc. use Ewing heaters coast to coast.

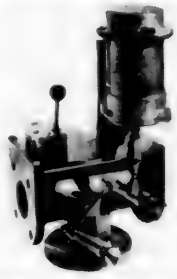
NOW offered in FOUR Convenient Models:

Recovery Per Hour	Storage Capacity	Height Inches	Inches in Diameter	BTU Input
850 gals.	226 gals.	82-In.	40-Inches	900,000
500 gals.	145 gals.	82-In.	31-Inches	520,000
300 gals.	85 gals.	77-In.	25-Inches	315,000
180 gals.	50 gals.	63-In.	20-Inches	190,000

Recovery figures based on 100 degrees F. temperature rise

Ewing MANUFACTURING CO.
2545 NW 10 P. O. BOX 875
OKLAHOMA CITY, OKLA.

IT'S NEW
IT'S BETTER
IT SAVES MONEY



The all-new Triangle Valve by U. S. Valve & Engineering Co. is a combination of TWO precision-engineered butterfly valves in a flanged T. It gives perfect flow control in cooling water systems where two streams flow to or from a single pipe.

The U. S. Triangle makes obsolete — in initial cost, ease of installation, maintenance, and general operating efficiency — the conventional use of separate flanged T and butterfly valves. If you're using or considering use of a T and 2 butterfly valves, a U. S. Triangle will save you money and do the job better.

U. S. TRIANGLE OFFERS:

- low initial cost
- minimum maintenance
- easiest installation
- choice of operators
- choice of seats
- longer life
- locked, no-thrust shafts
- vibration-proof construction
- in-line repair and service

UNITED STATES VALVE & ENGINEERING

P.O. Box 14015 Houston 21, Texas

Please send me — without obligation — detailed information on the all-new U. S. Triangle Valve.

Name_____

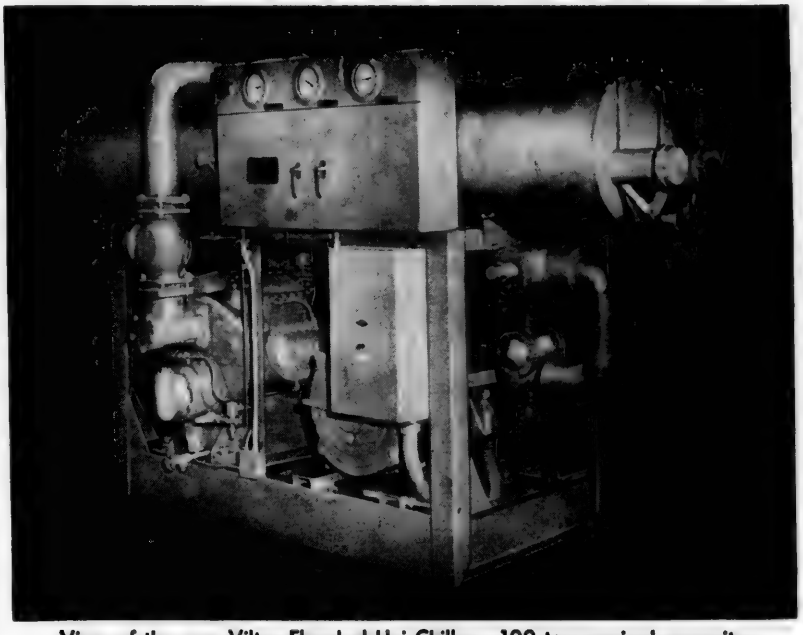
Company_____

Address_____

City & Zone_____

Title_____

Air conditioning made easy with new space-saving fully flooded Vilter Chiller



View of the new Vilter Flooded Uni-Chiller—100-ton nominal capacity.

Compact, space-saving design, low cost and a flooded water chiller are some of the important advantages of the new Vilter flooded type Uni-Chiller.

While especially suited for air conditioning applications, Uni-Chillers fit readily into almost any liquid chilling system.

Four standard sizes are offered—25, 50, 75 and 100-ton nominal capacities.

All components are sized to operate efficiently as a system. The flooded-type shell and tube cooler and the condenser are mounted above a rugged Vilter VMC compressor. Shipped assembled, the Uni-Chiller arrives with all interconnecting piping completed, controls factory wired, cooler and low-temperature piping insulated and a holding charge of refrigerant.

Motor and starter can also be supplied by Vilter and if desired, the compressor and motor can be run-in and all controls and gauges properly adjusted and set. By specifying a completely assembled unit, installation costs and start-up time are reduced . . . real savings to you.

Why not contact your nearest Vilter representative or write directly to Vilter for full details and application recommendations.

Vilter® refrigeration air conditioning

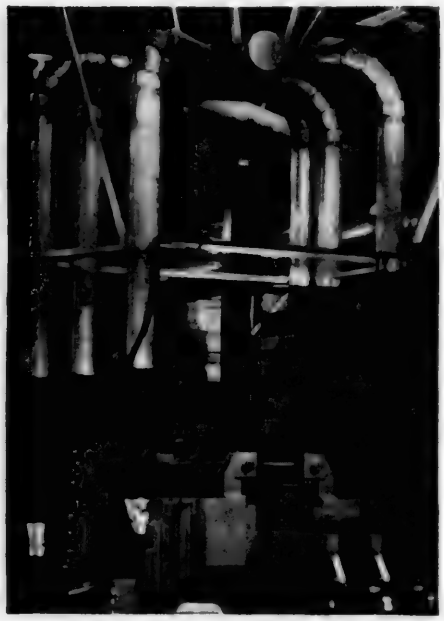
The Vilter Manufacturing Company
Milwaukee 7, Wisconsin

Air Units • Ammonia and Freon Compressors • Booster Compressors Baudelot Coolers • Water and Brine Coolers • Blast Freezers Evaporative and Shell and Tube Condensers • Pipe Coils Valves and Fittings • Pakice and Polarflake Ice machines.

We will be pleased to send you complete details on the above equipment.

Write Vilter Dept. G-913

YOU SAVE MORE WITH FLEXAUST® HOSE



Thousands of successful installations prove that use of Flexaust hose and Portovent retractable duct with metal duct systems lower installation costs — but there are other important advantages

Exceptional abrasion resistance
Corrosion resistance
Noise absorption
Durability under heavy flexing
Provision for expansion and contraction
Easy relocation of hoods and machines

Made of high quality neoprene coated fabrics 1¼ to 36" i.d.

Write today for full details
Distributors in all principal cities

THE FLEXAUST CO.

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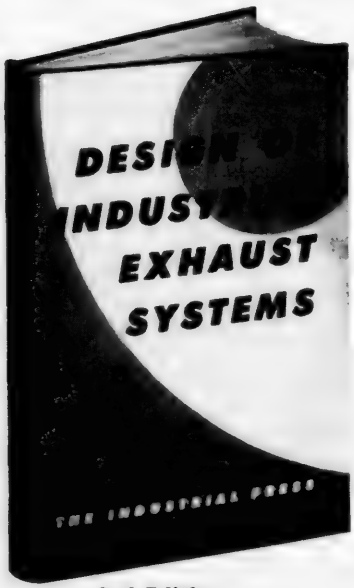
NEW YORK 17, N. Y.

THE ABC's OF INDUSTRIAL EXHAUST SYSTEMS



How To Design, Build or Buy Efficient Industrial Exhaust Systems

All in one convenient volume—everything you need to know to design, build or buy an industrial exhaust system that meets the demands of the industrial hygiene expert and the law. DESIGN OF INDUSTRIAL EXHAUST SYSTEMS presents the facts about the various types of exhaust systems for the removal of dust, fumes, vapors, gases, steam. Concise information is also included on low pressure conveyors for carrying bulky materials, such as grain or sawdust, by air stream.

You can design practically any type of exhaust system completely from the information this book contains—without using any other references. Send for it today!

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Completely Revised

$6.00
To order, circle letter E on postcard, last page.

256 Pages 137 Drawings, Charts and Diagrams

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

BRIEFLY STATED NEWS ITEMS

H. K. Siefers, Jr. has been appointed manager of Engineering Service Department of A. M. BYERS COMPANY, Pittsburgh, Pa. Mr. Siefers joined Byers in 1956, serving in the Engineering Department. He was previously associated with Hall Laboratories, division of Hagan Chemicals and Controls, as an engineer. . .

ALBERT KAHN ASSOCIATED ARCHITECTS AND ENGINEERS, Detroit, Mich., announced the appointment of R. M. Doering as chief power plant engineer, succeeding Paul Preuthun who has retired after 37 years' association with the firm. Mr. Doering joined the Kahn organization in 1942. In 1948 he was made an associate, and since 1956 has served as assistant chief of the firm's power division. He is a registered professional engineer and holds certificates from the National Bureau of Engineer Registration as well as from the State Boards of Michigan and Indiana. . .

Gregory Gould, president of FUEL ENGINEERING COMPANY of New York, has been appointed to the National Panel of Arbitrators, it was announced by American Arbitration Association. He will serve as an arbitrator of commercial disputes. A registered professional engineer in New York, Mr. Gould is a consultant on fuels and combustion, steam boilers, air pollution, dust, gas loading and related matters. The National Panel of Arbitrators consists of some 16,000 business and professional men throughout the country who volunteer their services as arbitrators of controversies between businessmen. The decisions they render are enforceable under federal and state laws.

NAME CHANGE

BUENSOD-STACEY CORPORATION has been formed following the merger of its predecessor, Buensod-Stacey, Inc., with Aeronca Mfg. Corp. on March 21. Milton S. Smith,

formerly president of Buensod-Stacey, Inc., and a newly elected vice-president and director of Aeronca, said that the new corporation will operate as a separate subsidiary of Aeronca with no change in Buensod's organization or policies.

Merger of the two companies was approved by a vote of the stockholders on March 11. Buensod is a pioneer in the development and manufacture of high velocity air conditioning equipment. Aeronca is an engineering, manufacturing and development corporation, primarily in the aircraft and missile industry.

BURGEONING BUSINESS

Three new sales agents were named by CLEAVER-BROOKS COMPANY, Milwaukee, Wis., to handle the sale of the company's packaged fire-tube boilers. The agents include Joe Trabue Co., St. Louis, Mo., serving eastern Missouri and western Illinois; Tate Engineering, Inc., Baltimore, Md., serving the Baltimore area; and Dixie Boiler & Equipment Co., Nashville, Tenn., serving south central Kentucky and central Tennessee, including the Chattanooga area. . .

Acquisition of controlling interest in The Grover Company, Detroit, Mich., by THE POWERS REGULATOR COMPANY, Skokie, Ill., was announced. The agreement, which calls for no changes in operation of the companies, makes Grover a subsidiary of Powers. W. F. Grover will continue as president of Grover. The Grover Company is one of the principal manufacturers of systems for cost reduction in offices and factories by transmission of messages and small items through pneumatic tubes. Users include hospitals, publishing houses, factories and transportation terminals. . .

Warehouse facilities on the West Coast have been opened by THE WIREMOLD COMPANY, Hartford, Conn., for its line of flexible air duct. The facility is located at 227 Bieghle Street, Stockton, Calif. The operation will serve customers in the nine western states of Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, Washington, and

New SUN-X Glass Tinting makes Air-Conditioning more efficient!

Here's a new, practical way to cut air conditioning operating costs by as much as 30% . . . to provide satisfactory cooling when the air conditioning equipment proves to be a little too small for the job . . . to keep your air conditioning equipment bids at rock bottom.

You can do all those things by keeping heat *out* of the building — by having the existing windows tinted with new Sun-X Glass Tinting. Sun-X, a revolutionary product by DuPont, eliminates up to *82% of the sun's heat rays.* Think how that affects the air conditioning requirements in modern buildings with their large glass areas!

This remarkable new transparent glass tinting is applied quickly and neatly to windows, without disrupting the regular business routines. It bonds tightly and is guaranteed in writing not to chip, crack or peel. No special cleaning is needed — Sun-X tinted windows are washed just like any other windows.

Available in 11 distinctive colors, Sun-X gives your customers the distortion-free appearance and convenience of factory-tinted glass at a fraction of the cost. See for yourself — send for free folder today!

Control heat, fade and glare with modern, low-cost Sun-X Glass Tinting.

Manufactured by DuPont

Better things for better living . . . *through chemistry*

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Houston 6, Texas

Please send free copy of "Solve Sun Problems with Sun-X"

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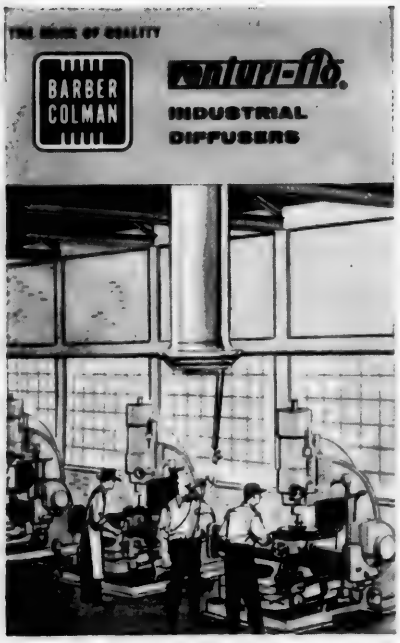
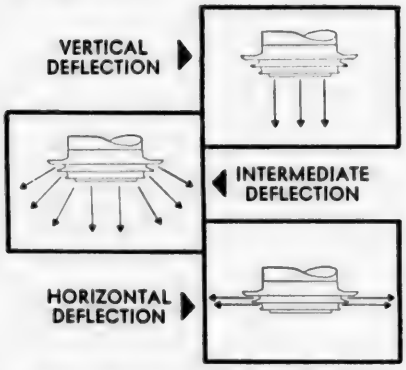


Fresh air at working level improves employee efficiency

Barber-Colman Model BP Venturi-Flo industrial diffusers permit air to be piped down to working level. This prevents stagnant, smoky air which has collected near the roof, from being mixed with the incoming fresh air. The contaminated air is readily expelled by roof exhaust fans. Employee comfort and efficiency are measurably improved.

The Venturi-Flo industrial diffuser can be adjusted easily from the floor to deliver any air pattern. In warm weather, the air should be delivered close to, or even directly at, the worker; while



during cool evenings, or in cold weather, the air should be diffused above the head of the worker, providing adequate ventilation, but eliminating cold drafts.

A complete range of sizes is available to meet any industrial requirement. Get complete information in Bulletin F7722-1 — performance data, installation diagrams, and dimensions. Call your Barber-Colman field office or write:

BARBER-COLMAN COMPANY

Dept. E, 1102 Rock Street, Rockford, Illinois

Briefly Stated

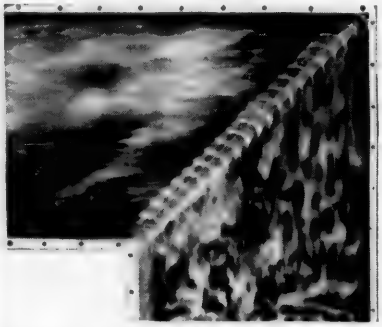
Wyoming. Initially, 10-ft lengths of duct for air conditioning, general industrial ventilation, and materials handling and heavy abrasive work will be stocked. . .

JOHNS-MANVILLE CORPORATION, New York, N.Y., has licensed The Flintkote Company to manufacture high- and low-pressure asbestos-cement pipe long marketed by J-M under the trade name Transite and will design and engineer new Flintkote production facilities for this purpose, it was announced. Flintkote is planning on entering the asbestos-cement pipe field with two new plants—one in the East and one in the West. These products would be merchandised under the brand name Orangeburg through the Orangeburg Manufacturing division, a producer of fiber and plastic pipe and conduit acquired by Flintkote in November, 1958. . .

Stockholders of Speedy Manufacturing and Sales Corporation, Amarillo, Tex., have announced the sale of a controlling interest in the company to WORCESTER PRESSED STEEL COMPANY, Worcester, Mass. The company has been renamed Westprest, Inc., and it will be a subsidiary of Worcester. Westprest will continue to sell Speedy's line of evaporative coolers, chamois rollers and Westprest prefabricated duct. In addition, Westprest will be gradually built up as a source of custom metal stampings. . .

AIRTEMP DIVISION, CHRYSLER CORP., Dayton, Ohio, has established a nationwide network of thirteen parts depots to sell replacement parts to its distributors and their dealers, independent service companies, contractors and industrial users. The major policy change was made in order to improve and economize parts delivery. In the past, each Airtempt distributor ordered parts from the Dayton factory and in most cases maintained an extensive parts inventory. Some of the advantages of the new system will be faster delivery of parts to customers; a central location in major trading areas which will become familiar to distributors, contractors and independent servicemen as

How Barber-Colman Airturns pay off



You can save space and money by using Barber-Colman Airturns to guide air around corners in duct systems.

They minimize pressure losses, too. Extensive laboratory and field studies show that pressure drops in square elbows with Airturns are less than 20% of the velocity head. This equals the performance of space-consuming, long-radius elbows without vanes. It is superior to the performance of any other factory-made units available. It is two to four times better than the performance of contractor-fabricated vanes studied.

Cost is in favor of Airturns. Installation is less than that of long-radius elbows. Factory mass production results in modest initial cost. And, the cost of call-backs often is reduced by improved system performance.

When you add up all the benefits, Barber-Colman Airturns pay off well. They are available cut to size, ready to install, or in 48″ x 48″ slabs.

For complete details, call your local Barber-Colman Air Distribution field office, or write for literature.

BARBER COLMAN **Uni-Flo** ENGINEERED AIR DISTRIBUTION

BARBER-COLMAN COMPANY

Dept. E, 1102 Rock Street, Rockford, Illinois

the headquarters for Chrysler parts; and lower freight rates, since the parts will be F.O.B. from the depot, not Dayton. The depots will be located in Washington, D.C., Atlanta, New Orleans, Memphis, Detroit, Chicago, Kansas City, Phoenix, Dallas, Los Angeles, Dayton and New York, which will have two depots. . .

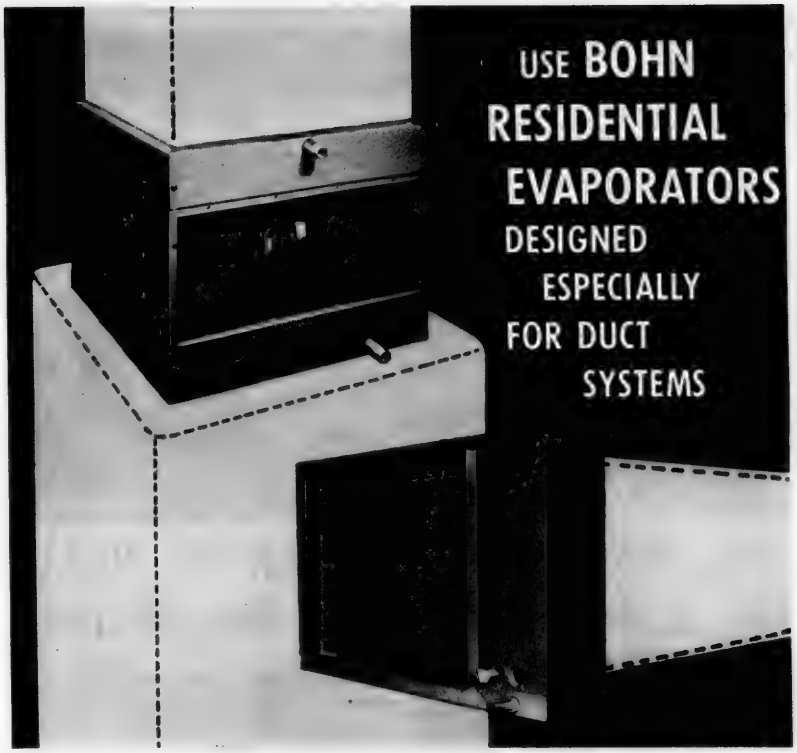
EDWIN L. WIEGAND COMPANY, Pittsburgh, Pa., manufacturer of Chromalox electric heating elements and equipment, announced its acquisition of Barber Infrared Associates, Bradner, Ohio, as a subsidiary which becomes Radcor, Inc. Radcor, in a modern, newly equipped plant, will specialize in design, production and application of complete electric infrared ovens, low-temperature furnaces, radiant space heaters, fluid heat-transfer systems, and asphalt plant heating equipment. Radcor will be represented by Chromalox sales-engineering representatives with staffs located in most principal cities in the United States.

RECENT APPOINTMENTS

Thomas J. Hunt has been elected vice-president of JAY R. SMITH MANUFACTURING COMPANY, Union, N.J. Formerly general sales manager, Mr. Hunt joined the company in 1949 as New Jersey sales representative, and was previously with the Church Seat Division of American Radiator and Standard Sanitary Corporation. As vice-president, Mr. Hunt will continue as director of sales for the company's line of chair carriers, drains, shock controls, and other engineered plumbing products, in addition to assuming new overall management duties. . .

Promotion of Graeme B. Supple to a position in charge of future planning and development for products on the air side of air conditioning product lines was announced by AMERICAN-STANDARD INDUSTRIAL DIVISION, Detroit, Mich. Mr. Supple will carry the title of product manager.

Replacing Mr. Supple as manager of the Division's Great Lakes sales region is J. A. McCain, former



Provide predictable performance . . . they're rated at ASRE conditions

BAV unit for vertical installations

Same unit mounts *above* or *below* furnace. Two galvanized steel drain pans permit mounting in "A" or "V" position.

BH unit for horizontal installations

Can be installed with air flow *in either* direction; all sizes have duct flanges on both sides. Double drain pan with 1" insulation prevents sweating.

Both models give you . . .

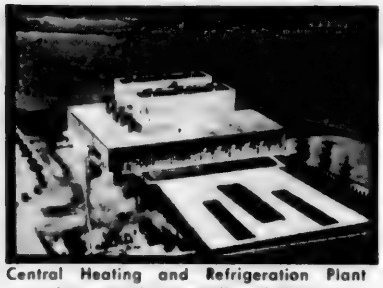
- Five sizes to match condensing units of 2, 3, 4, 5 and 7½ hp.
- Bonderized steel cabinets with grey hammertone enamel finish . . . fully insulated
- Circuiting suitable for R-12 or R-22
- Large access panels
- Ample space inside for expansion valve
- UL listed

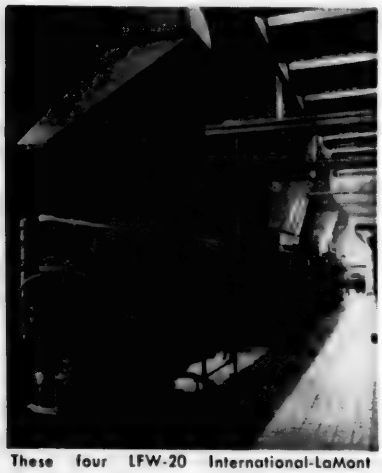
Ideal for either new or existing residential systems.

BOHN *Buy the known line . . . the BOHN line*
ALUMINUM & BRASS CORPORATION
Danville Division • Danville, Illinois

655-acre "Terminal City"—New York International Airport

THE INTERNATIONAL SHOW PLACE for HIGH TEMPERATURE WATER


Central Heating and Refrigeration Plant keynotes the versatility of HTW


These four LFW-20 International-LaMont Generators have a combined capacity of 160,000,000 Btu/hr.

The unmatched economies of high temperature water are realized throughout the year at New York International Airport. In addition to heating the vast Terminal City, HTW (380° F. at outlet) produced by four International-LaMont Generators feeds nine absorption machines in the unique Central Heating and Refrigeration Plant—the first of its type. Visit it next time you stop at Idlewild.

International Airport is only one of the major HTW installations both here and abroad. To date, more than 130 International-LaMont High Temperature Water Generators are in operation with a total capacity exceeding THREE BILLION Btu/hr. All of these employ the proven LaMont principles of forced recirculation which permit temperature differential to 200° F. or more with no danger of thermal shock—the key to truly significant economies.

Take a closer look at HTW in terms of International-LaMont — the most experienced name in this rapidly growing field.

Get full details from your
INTERNATIONAL DISTRICT REPRESENTATIVE
or write for Bulletin 1600 today.

IBW BOILER BUILDERS SINCE 1886

THE INTERNATIONAL BOILER WORKS CO.

Steel Firebox Heating & Power Boilers
Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

890 Spruce St. East Stroudsburg, Pa.
Manufactured and sold in Canada under agreement with CANADIAN VICKERS LTD. Montreal, P. Q.

Briefly Stated

manager of the Detroit sales office. In other moves, R. L. Graham, former manager of the Moline office, was named manager of the Los Angeles office, and R. W. Dallas, former manager of the Buffalo office, was named manager of the Detroit sales office. . .

Appointment of Jack D. Tolliver to the newly established position of field sales manager was announced by TUBE TURNS DIVISION OF CHEMETRON CORPORATION, Louisville, Ky. Promotion of Mr. Tolliver from his position as Eastern regional sales manager expands his duties to include supervision of sales in all U.S. district office territories. . .

Appointment of M. M. York to the position of manager of marketing of its Industrial Equipment Division was announced by ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. He will be primarily responsible for overall direction, including organization, planning and coordination of sales and distribution activities of the Division, products of which include processing machinery, compressors, motors, control equipment, rectifiers, and pumps.

Charles F. O'Riordan was named manager of the company's North Central Region, succeeding Mr. York. This region includes district offices in Chicago, Peoria, Rockford, Milwaukee, Des Moines, Davenport, Minneapolis, Duluth, and Appleton, Wis.

Succeeding Mr. O'Riordan, who had been manager of the Group's Midwest region, is Robert E. Morris. This district includes St. Louis, Kansas City, Evansville, Indianapolis, Louisville, Memphis, Omaha, and Wichita.

Succeeding Mr. Morris is J. A. Sudduth, the newly appointed manager of the St. Louis district, who, in turn, is succeeded by William S. Wright to the managership of the Grand Rapids, Mich., district. . .

Appointment of Milton Levine as district sales manager in metropolitan New York and Westchester County for WELBILT AIR CONDITIONING AND HEATING CORPORA-

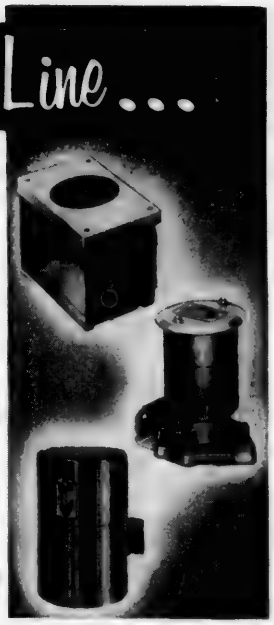
(Continued on page 146)

NEW WASHABLE AIR FILTER USES NO OIL

A new air filter panel developed by Air-Maze is completely dry, yet can be washed in cold water. Extended surface design provides more than four times the effective surface of conventional panels. Made of corrosion resistant Amylon (an inert, bonded synthetic fiber mat) encased in a galvanized frame between two layers of aluminum screen. Highly efficient, unaffected by varying air velocities and temperatures. Lasts indefinitely. Available in 1″ and 2″ thicknesses and in all popular sizes. Write for Bulletin 376-151, **The Air-Maze Corporation, Dept. AC-5, Cleveland 28, Ohio.**

A Complete Line...

LOW COST
CONDENSATE
DISPOSAL PUMPS
designed for
AIR CONDITIONING AND REFRIGERATION



MODEL AB-F
"All-Plastic" low cost unit. 9 ft. V., lift. 300 ft. H. run. In-pan installation. Sump available when required.

MODEL "C"
For CLOSE-TO-FLOOR, low inlet connection. 21 ft. V. lift. 300 ft. H., run. Packaged unit. Long life.

MODEL C21-F
Extra Heavy Duty pump, with sump and float switch built in. Trouble-free service. 21 ft. V. lift. 300 ft. H. run.

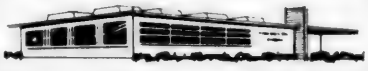
ALL MARCH PUMPS ARE FURNISHED WITH 110/220 VOLT MOTORS. FACTORY TESTED AND READY TO RUN. MINIMUM INSTALLATION COSTS.

Write today for ***Free Bulletins*** *on these pumps!*

MARCH MANUFACTURING CO.
INCORPORATED
CONDENSATE PUMPS FOR AIR CONDITIONING EQUIPMENT
8015 NORTH LAWNDALE AVENUE ● SKOKIE ILLINOIS

DAVIDSON

LOW PROFILE



HIGH CAPACITY
low velocity roof fan

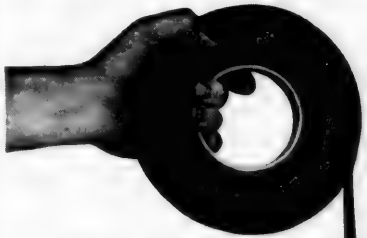
PC PLEASING CONTOUR MODEL

New and streamlined . . . designed for today's modern flat roof structures . . . as much as 40% lower than conventional types . . . capacities up to 50,000 CFM . . . low velocity . . . vibration isolated . . . ratings conform to Standard Test Code.

DAVIDSON, first in the field, has been making a complete line of industrial and commercial roof fans since 1915. For information on the PC or other HYDUTY Davidson fans, write to

Charter Member AMCA

DAVIDSON FAN CO.
213 California St., Newton 58, Mass.



FLAME-RESISTANT

Arno DUCTAPE
TRADEMARK

FOR DUCTS AND INSULATION

- ✓ Complies with all building codes for flame-resistant duct tapes.
- ✓ Self-adhesive . . . sticks to any duct material or insulation.
- ✓ Will not support flame . . . holds firmly at high temperatures.
- ✓ Nothing to mix . . . saves labor.
- ✓ Vaporproof . . . waterproof.
- ✓ Meets ASTM standards.

Ask your jobber for DUCTAPE.

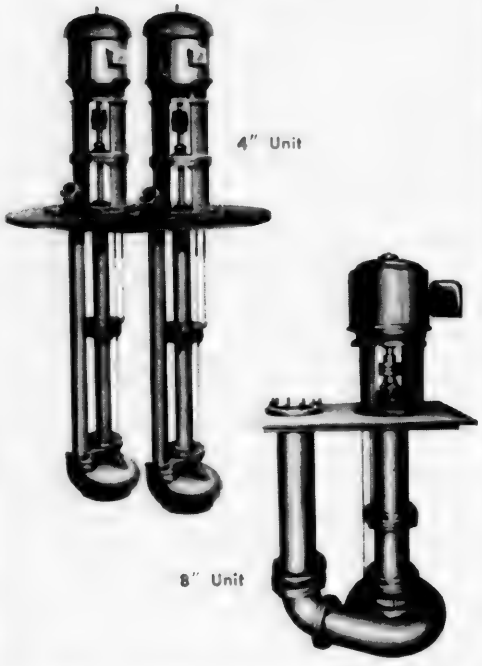
Write for **FREE** *test sample!*

ARNO ADHESIVE TAPES, INC.
Dr. Scholl's Adhesive Tape Division
4106 Ohio St., Michigan City, Ind.

7 OUTSTANDING ADVANTAGES OF NON-CLOG SEWAGE PUMPS

"from Chicago"

1. 50 years of pump manufacturing experience.
2. Balanced impellers passing large spheres provide quiet operation with high pump and high non-clogging efficiency.
3. Expansion joints in discharge pipe prevent pump distortion and resulting bearing failures.
4. Simple, dependable micrometer adjustment permits easy setting of impeller clearance in pump casing to compensate for normal wear, maintaining maximum efficiency.
5. Heavy ball thrust bearings are located well above floor level to prevent water splashing into bearings.
6. Packing boxes built into floor plates prevent leakage.
7. Heavy duty shafts and bearings eliminate vibration and provide long life.



51 YEARS 1909 1960 CHICAGO PUMP COMPANY

FOR . . . handling sewage and drainage in buildings and industrial plants and for municipal sewage disposal.

SIZES . . . available in sizes from 4" to 8", with capacities from 50 to 3500 G.P.M.

Now available with *the new* SEALTRODE* Sealed Electrode Floatless Pump Controller . . . the *only* Controller featuring completely sealed Electrodes . . . positively preventing insulation or coating by grease or other corrosive elements.

Over 50,000 installations.

Write direct or contact Chicago Pump Company Distributors located in most principal cities for Bulletin 124-F and complete engineering data.

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Putting Ideas to Work

fmc FOOD MACHINERY AND CHEMICAL CORPORATION

FOOD MACHINERY AND CHEMICAL CORPORATION
HYDRODYNAMICS DIVISION
CHICAGO PUMP
622J DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Briefly Stated

(Continued from page 144)

TION'S line of air conditioning and heating products was announced by Peter Dalton, vice-president in charge of sales for the Farmingdale, N.J. company. Mr. Levine was a sales representative for the Cold Wave Cooling Corporation before his appointment by Welbilt. Previously he represented Tower Engineering Company. . .

Key assignments in the electronic instrumentation operations of DETROIT CONTROLS, a division of AMERICAN-STANDARD, have been announced. The moves follow final transfer of electronic instrumentation activities from Norwood, Mass., to Detroit. Howard H. Elliott, former product planning manager at Norwood, has been named manager of instrumentation marketing. Robert J. Jones, sales engineer with Brush Instruments Division of the Clevite Corp., Cleveland, has been appointed instrumentation sales manager. J. M. Maitland has become technical coordinator and in this position will be responsible for customers' technical instrumentation requirements as related to the division's activities. Mr. Maitland most recently was Detroit district manager for The Bristol Co., Waterbury, Conn. . .

Alfred B. Meeg has been appointed vice president-sales at BELL & GOSSETT COMPANY, Morton GROVE, Ill. Formerly sales manager for the company, Mr. Meeg succeeds William A. Boone who recently was named executive vice-president and treasurer. Mr. Meeg joined Bell & Gossett in 1949 as manager of national accounts. Prior to joining Bell & Gossett, he was manager of the Milwaukee, Wis., branch of Iron Fireman Manufacturing Co. . .

Henry W. Kuklinski has been named engineering manager for transportation air conditioning and refrigeration equipment at CARRIER CORPORATION, Syracuse, N.Y. Mr. Kuklinski has been with Carrier since 1952 and was formerly senior development engineer in the trans-

(Continued on page 148)

Airsan Viro Crimp
HIGH VELOCITY AIR FILTERS

VIRO CRIMP MEDIA
has special Hemmed Edges for strength and safe, easy handling. No Cuts! No Scratches! No Filter surface damage.

- MAXIMUM EFFICIENCY AT (300 — 600 FPM)
- MINIMUM RESISTANCE
- NO DIRECT AIR PASSAGE
- LARGE DUST HOLDING CAPACITY

Also Available . . .
Low Velocity and Grease Filters.
Write for catalogs and prices.

AFI MEMBER AIR FILTER INSTITUTE

Air Filter Corporation
4554-S W. WOOLWORTH AVE., MILWAUKEE 18, WIS.
Canadian Representative
DOUGLAS ENGINEERING CO., LTD., TORONTO

A few distributorships available.
Write for details!

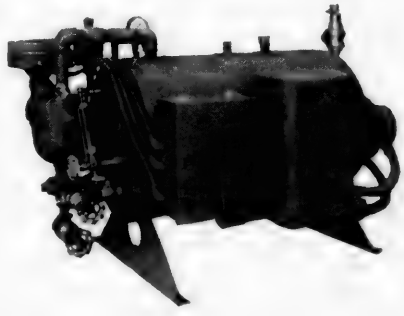
SYNCRO-FLAME
U. L. APPROVED **PRESSURE BURNERS**

DUAL-FUEL
GAS OIL
The Prestige Burner

Designed for the hard-to-fire jobs. Fires all types of boilers, warm air furnaces, and ovens. Standard features are "extras" on other burners. Flame retention . . . controlled flame pattern . . . rotary action flame . . . automatic fuel-air ratio . . . latest electronic safety control . . . polished aluminum housing. Factory wired and fire-tested.

Write today for detailed information

SYNCHRONOUS FLAME, Inc., 227 N. Main St., Walworth, Wis.



NEW—ELECTRIC STEAM BOILERS

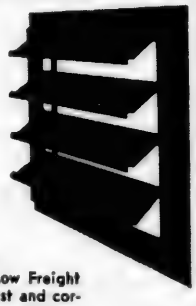
10 sizes — .6 H.P. to 6 H.P.
6 KW to 60 KW.
240 or 480 volts normal
208 " available
Highly sensitive adjusting controls.

ALL SIZES ASME construction,
National Board inspected,
Underwriters listed.
100 lbs. max. operating pressure.

Perfect for department store alteration rooms, plastic laboratories, hospitals, etc. Also full line of small gas fired and oil fired boilers, 100 to 125 lbs.

P. M. LATTNER MFG. COMPANY
Cedar Rapids, Iowa

Elgo Ventilating Specialties



NEW! EXTRUDED ALUMINUM SHUTTERS

Shutters of modern design which give you ALL of these features: Lightweight, Full Weather Strip, Low Freight Cost, Easier Installation, Concealed Pivot Pins, Rust and corrosion Proof and Natural aluminum finish with fluted frames.

Write for complete specifications.

Free CATALOG

ELGO SHUTTER & MANUFACTURING CO.
2732 W. Warren Detroit 8, Michigan

NOT A CUFF IN A CARLOAD

Wiremold Air Duct just doesn't need cuffed ends, attached cuffs, or any kind of cuffs or cuffing equipment.

Unlike any other duct — a flat metal spiral locks mechanically to the fabric — makes it cuffless and always ready to hook up, simply by sliding it over the end fitting. Fasten it with a sheet metal screw through the flat spiral — only possible with Wiremold — or secure it with a clamp. The flat spiral fits snugly against the fitting and won't slip out of place. Coated with cement, the hookup will be airtight.

Wiremold saves time and money on **every** connection. Find out more ways to save — send for new folder.

FOR AIR CONDITIONING / EXHAUSTING
MATERIALS HANDLING / MANY OTHER USES

WIREMOLD®
AIR DUCT

THE WIREMOLD COMPANY • HARTFORD 10, CONN.

THE WIREMOLD CO., HARTFORD 10, CONN. 5-0A
Please send NEW folder.

name

company

address

city state

Briefly Stated

(Continued from page 146)

portation department. He succeeds James Swinburne, who was named division staff engineer. . .

T. C. McKee has been appointed manager of sales service for DETROIT CONTROLS DIVISION OF AMERICAN-STANDARD. In this capacity he will supervise policy, customer service, service training, contracts and factory warehouses at Stratford, Conn., Cleveland, Ohio and Melrose Park, Ill. He also will have jurisdiction over service agencies and replacement depots. . .

In a recent reorganization of its field selling organization, BURNHAM CORPORATION, HEATING & COOLING DIVISION, Irvington, N.Y., appointed five new district managers. C. Fred Hill will handle the northeastern district, covering Cambridge, Springfield and upstate New York branches; Philip Barrett, the Metropolitan New York District; G. M. Corcoran, the Middle Atlantic District, covering Philadelphia, Lancaster and Baltimore branches; J. Roy Knox, the Central Region District, covering Pittsburgh, Zanesville and Detroit branches; and J. A. Harris, the Chicago District. . .

O. M. Raith has been appointed sales specialist for the air conditioning and refrigeration industry by GENERAL ELECTRIC'S GENERAL PURPOSE CONTROL DEPARTMENT, Bloomington, Ill. Formerly sales manager for the company's Hermetic Motor Department, Mr. Raith will be responsible for sales of general purpose control to the air conditioning and refrigeration industry's original equipment manufacturers. . .

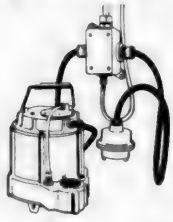
Dr. John S. Burlew has been appointed director of research and Dr. Dewey J. Sandell has been appointed director of development for Research and Development Division, CARRIER CORPORATION, Syracuse, N.Y. Dr. Burlew will assume the position now occupied by Dr. Dewey J. Sandell. Both the Research and Development Departments have been expanding rapidly, and a director for each is now necessary, the company says. . .

Here's the NEWEST in
KENCO
Submersible Pumps
The Original and best yet!
A-1246A

NEW 3-phase 230-volt Industrial Pump

Rugged cast-bronze construction with 5000 GPH at 10' head pumping power, this new Kenco Model 330 is fully automatic, complete with external liquid level control and motor starter. Non-automatic model furnished as pump only.

NEW Variable Hi-Turn-On Heavy-Duty Pump



To remove measured amounts of fluid automatically determined by the height at which the hi-turn-on control is set, Kenco's complete pump package also eliminates frequent cycling. This watertight unit is designed for operation in humid atmospheres or where flooding of power source may occur.

Approved Multi-Purpose Model 109 Pump

Moves fluids fast—3300 GPH at 10' head—bronze or cast iron—easy to install, no floats to adjust, no wires to foul up.

See Your Wholesaler!

KENCO PUMP
Division of The American Crucible Products Co.
1305 Dublin Avenue • [illegible]

Briefly Stated

Leo E. Starr, a 32-year veteran of ship air conditioning and 37-year veteran in the refrigeration and air conditioning field, retired as manager of the Marine Department of Carrier Corporation. He had been head of the department since 1943, and affiliated with Carrier and with the Brunswick-Kroeschell Company which was merged into Carrier in 1930, throughout his career in this field.

When Mr. Starr, a Princeton civil engineering graduate and World War I naval officer, joined Brunswick-Kroeschell Company in 1923, he recalled that there was no shipboard air conditioning. Refrigeration equipment for cargo and ships' stores used carbon dioxide and ammonia as refrigerants.

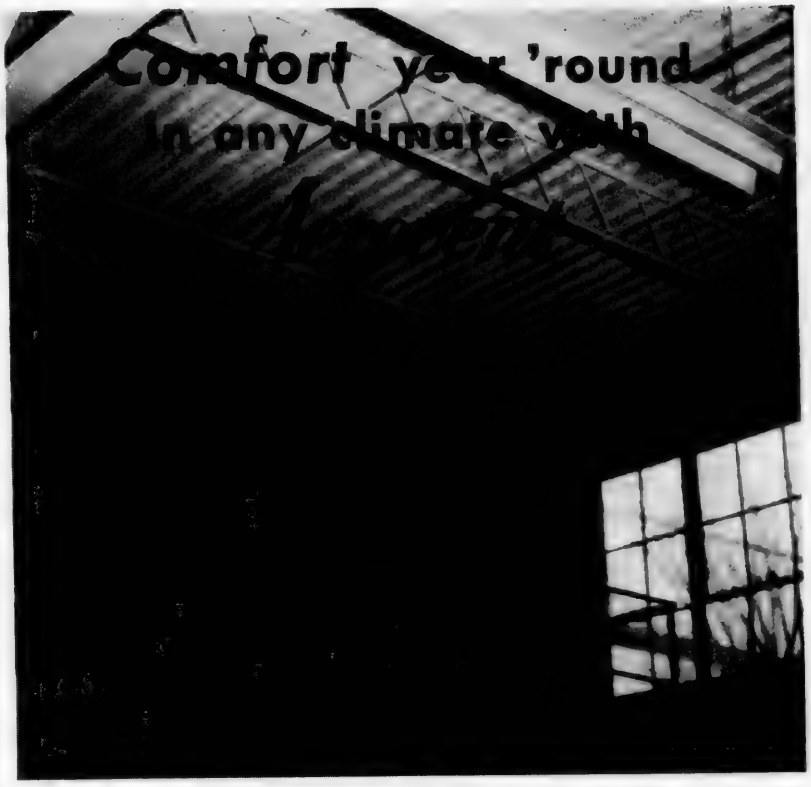
The introduction of non-toxic refrigerants at about the time he became a specialist in marine work, led to the development of shipboard air conditioning. The first installations, during the 1930s, provided air conditioning only in dining saloons, with other public areas being served on later vessels.

After World War II the air conditioning of passenger cabins became standard practice, and in recent years the crew quarters have also been covered by the air conditioning systems.

OBITUARIES

Bernard H. Krueger, an authority on the design of underground conduits for district heating and cooling systems, died as the result of a heart attack on March 30. For the past twelve years he has been with the consulting engineering firm of Guy B. Panero Engineers, 630 Third Avenue, New York City. Readers of Air Conditioning, Heating and Ventilating will remember him as co-author, with Ernest Morris, of Data Sheets on gate, globe and check valves. . .

James Chapman Matchett, 74, Chicago, who retired in 1954 as president of Illinois Engineering Company, died on March 24. He was chairman of the publications board of the Friends' five year meeting, and a member of the Earlham College Foundation Board and the American Friends Service Committee.



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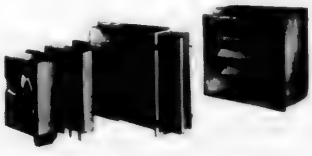

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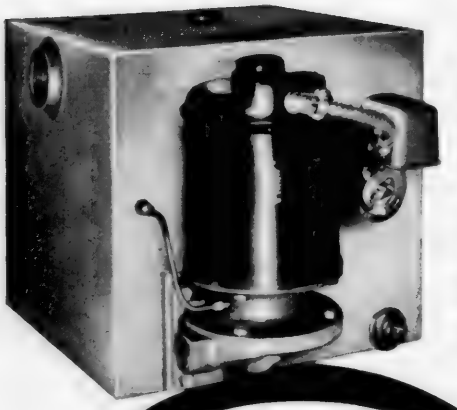

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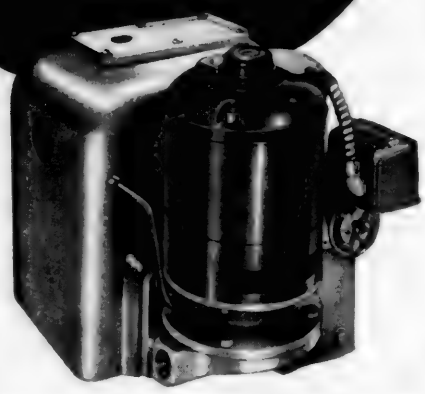

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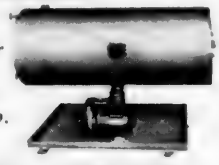

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BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

INDUSTRIAL VENTILATION MANUAL

The sixth edition of the Industrial Ventilation Manual prepared by a committee of the American Conference of Governmental Industrial Hygienists and just published, is a considerable enlargement of previous editions. The volume includes design data, practical hood design, and procedures for design of duct work and selection of fans and dust collectors. Recommended practices are approved by Federal, state and municipal industrial hygiene departments.

The new edition includes information on low volume high velocity systems, new hood design diagrams, fan performance curves, corrosion characteristics of plastics, new material on radiant heat, high temperature and low temperature psychrometric charts, and a revised section on testing of ventilation systems. Principles and applications are illustrated with approximately 138 drawings including 64 specific hood designs.

Industrial Ventilation, a manual of recommended practice by The Committee on Industrial Ventilation. Spiral bound, 8½ x 11 inches. Published by Committee on Industrial Ventilation, P. O. Box 453, Lansing 2, Mich. Price, hard cover $7, flexible cover, $4.

RECOMMENDED OUTDOOR DESIGN TEMPERATURES— The research committee of the Southern California Chapter, ASHRAE has issued a 14-page publication on Recommended Outdoor Design Temperatures for Southern California, Arizona, and Nevada. The tables supersede those in the first edition that was published in 1957. The new edition has 50 new localities, particularly in fast-growing Arizona. B. Lee Hutchinson, chapter treasurer, 6824 Vineland Ave., N. Hollywood, Calif. Price, $1.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

MECHANICAL CONTRACTORS MEETING—Annual meeting of the Mechanical Contractors Association of America, at the Hotel Waldorf-Astoria, New York City. T. J. Ryan, secretary of the Association, 45 Rockefeller Plaza, New York 20, N. Y. . . **MAY 9-12, 1960.**

ISA CONFERENCE AND EXHIBIT—ISA Instrument-Automation Conference and Exhibit, at Brooks Hall, San Francisco, Calif. W. H. Kushnick, executive director of the Instrument Society of America 313 Sixth Ave., Pittsburgh 22, Pa. . . . . **MAY 9-12, 1960.**

METAL EXPOSITION & CONGRESS—2nd Southwestern Metal Exposition & Congress, at State Fair Park, Automobile Building. Dallas, Tex. C. L. Wells, exposition manager, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. . . . . **MAY 9-13, 1960.**

APCA MEETING—Fifty-third annual meeting of the Air Pollution Control Association, at the Hotel Netherland-Hilton, Cincinnati, Ohio. C. W. Gruber, conference chairman, 2400 Beekman St., Cincinnati 14, Ohio. . . . . **MAY 22-26, 1960.**

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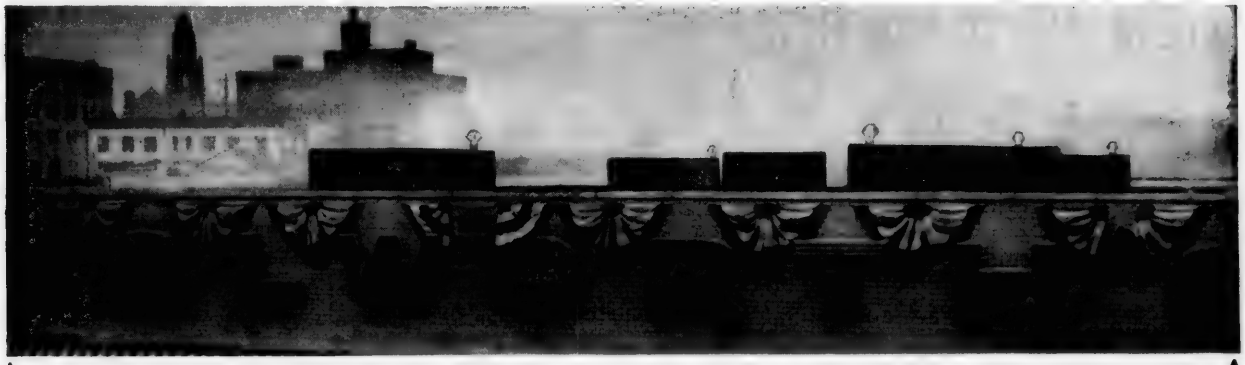

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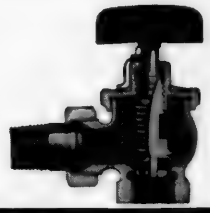
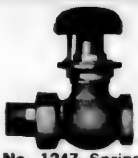


Sarco No. 45 Bellows-Packless Steam Radiator Valve, Modulating Type



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(Concluded from page 150)

DESIGN ENGINEERING SHOW—ASME Design Engineering Conference and Show, at the Statler Hilton Hotel, New York, N. Y. Secretary, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. . . . . **MAY 23-26, 1960.**

SAE MEETING—Summer meeting of the Society of Automotive Engineers, at the Edgewater Beach Hotel, Chicago, Ill. Secretary of the Society, 29 W. 39th St., New York, N. Y. . . . **JUNE 5-10, 1960.**

I-B-R MEETING—Annual meeting of The Institute of Boiler and Radiator Manufacturers, at the Seaview Country Club, Absecon N. J. Secretary of the Institute, 60 E. 42nd St., New York, N. Y . . . . . **WEEK OF JUNE 6, 1960.**

NDHA MEETING—Annual meeting of the National District Heating Association, at Grove Park Inn, Asheville, N. C. Secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. . . . . **JUNE 6-9, 1960.**

ASHRAE MEETING—Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., at Royal York Hotel, Vancouver, B. C., Canada. Secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JUNE 13-15, 1960.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JUNE 26-JULY 1, 1960.**

CONGRESS ON OCCUPATIONAL HEALTH—13th International Congress on Occupational Health, at the Waldorf-Astoria Hotel, New York City. James W. Muckell, executive secretary, Room 415 527 Madison Ave., New York 22, N. Y. . . . . **JULY 25-29, 1960.**

CRYOGENIC ENGINEERING CONFERENCE — 1960 Cryogenic Engineering Conference sponsored by the University of Colorado and the National Bureau of Standards at the University of Colorado, Boulder, Colo. K. D. Timmerhaus, secretary, Chemical Engineering Department of the University, Boulder, Colo. **AUGUST 23-25, 1960.**

POWER EXPOSITION—24th National Exposition of Power & Mechanical Engineering, sponsored by the American Society of Mechanical Engineers, in conjunction with its annual meeting, to be held at the New York Coliseum, New York City. E. K. Stevens, International Exposition Co., 480 Lexington Ave., New York 17, N. Y. . . . . **NOVEMBER 28-DECEMBER 2, 1960.**

Canadian Degree-Days for March, 1960*

City	March		Cumulative	
	1960	Normal	1959-60	Normal
Calgary, Alta.	1318	1200	7906	7740
Charlottetown, P. E. I.	1190	1220	6378	6900
Crescent Valley, B. C.	1029	940	6969	6600
Edmonton, Alta.	1414	1290	8473	8660
Fort William, Ont.	1509	1380	8606	8750
Grande Prairie, Alta.	1531	1380	8113	9100
Halifax, N. S.	1077	1042	5521	5997
London, Ont.	1363	1040	6458	6250
Medicine Tat, Alta.	1259	1130	7721	7510
Moncton, N. B.	1205	1190	6630	7190
Montreal, P. Q.	1288	1180	7031	7240
North Bay, Ont.	1534	1350	8295	8210
Ottawa, Ont.	1353	1220	7404	7520
Penticton, B. C.	803	780	5644	5520
Prince George, B. C.	1158	1110	7646	7760
Quebec City, P. Q.	1312	1300	7643	7960
Regina, Sask.	1591	1420	9443	9190
St. John, N. B.	1192	1160	6523	7040
Saskatoon, Sask.	1585	1440	3025	9390
Timmins, Ont.	1751	1530	9508	9400
Toronto, Ont.	1233	1018	5993	5936
Vancouver, B. C.	705	680	4473	4430
Victoria, B. C.	700	620	4294	4050
Windsor, Ont.	1235	950	5858	5710
Winnipeg, Man.	1611	1441	9430	9178

* These data are supplied through the courtesy of the Meteorological branch, Air Services, Department of Transport, Canada.

The Department reports slight revisions in the figures for February as published in last month's issue. Corrected figures are Crescent Valley, B. C., 1042; Prince George, B. C., 1185; Saskatoon, Sask., 1663.

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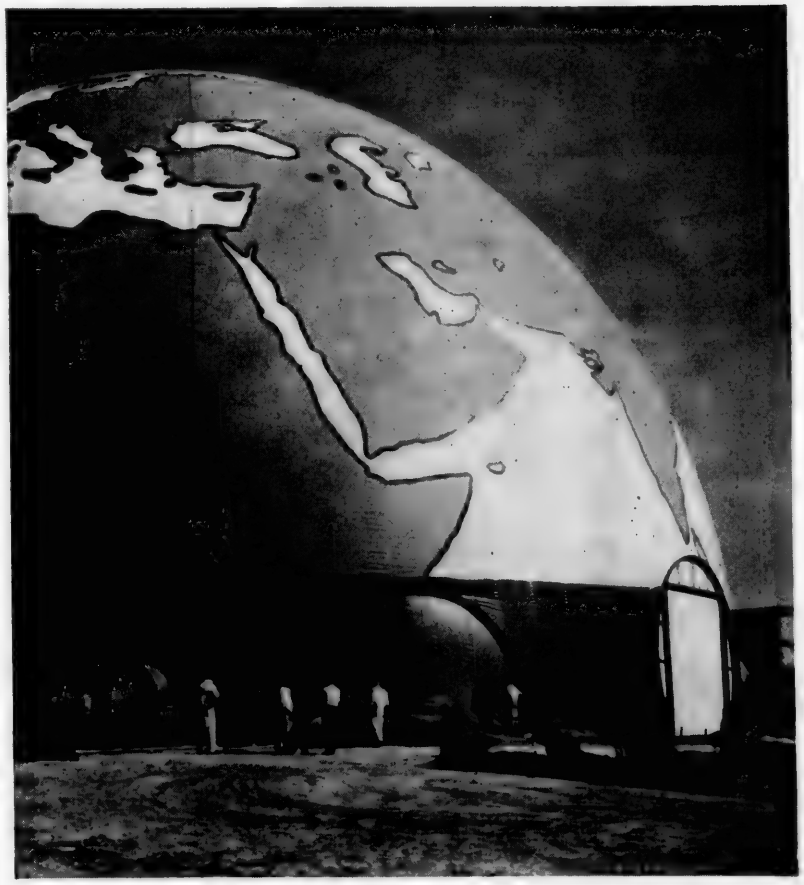

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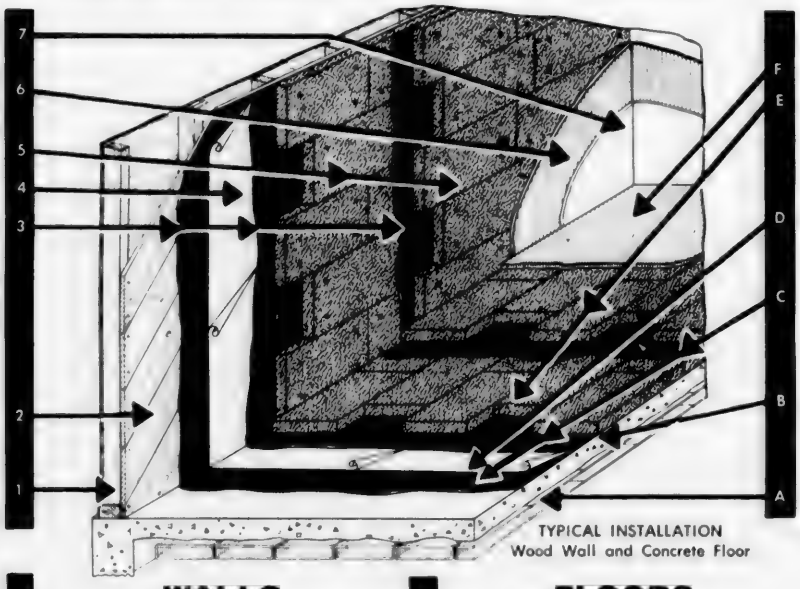

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WALLS

1 **WOOD STUDS**

2 **WOOD SHEATHING**

3 **LAYKOLD INSULATION ADHESIVE**
Brush or spray at 23 sq. ft. per gallon. Allow to set (turn black) then press on membrane or blocks

4 **VAPOR BARRIER MEMBRANE**
Press into adhesive. Use 3" laps; 1 to 3 layers.

5 **INSULATION BLOCKS**
When first layer has been placed, set skewers and repeat for next layer of insulation.

6 **LAYKOLD MASTIC WEATHERCOAT**
Point joints and trowel scratch coat at 8 sq. ft. per gallon. Let dry.

7 **LAYKOLD WEATHERCOAT**
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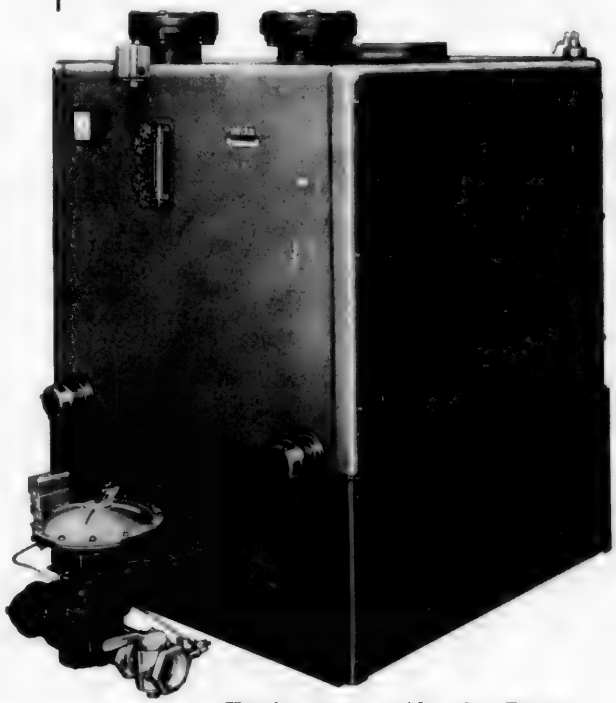
the BRYAN 500 ..... compact ..... easily installed ..... fast heat transfer



BRYAN *Copper Tube* **BOILERS**

Engineers specify the Bryan 500 Series Boiler with confidence . . . certain of rapid, maximum heat transfer with proven Bryan Copper Tubes. Compact, space saving and completely assembled, the Bryan 500 installs quickly anywhere.

Bryan Boilers are also available with firing rates as low as 125,000 BTU's.

SPECIFICATIONS

Boiler Model No.	Firing Rate			Gross Output BTUs per Hour	Net Load Recommendations		
	BTUs per Hour	Nat. Gas Cu. Ft. per Hour	Oil Gal. per Hour		BTUs per Hour	Hot Water Radiation Sq. Ft.	Steam Radiation Sq. Ft.
518	1,500,000	1500	10	1,200,000	900,000	6000	3750
519	1,750,000	1750	12	1,400,000	1,060,000	7100	4420
522	2,000,000	2000	14	1,600,000	1,230,000	8200	5130
523	2,250,000	2250	16	1,800,000	1,400,000	9300	5850

Bryan Copper Tube boilers are designed and built to the requirements of the A.S.M.E. Code. Gas-fired models A.G.A. approved.

For further information, write or phone

BRYAN STEAM CORP. Peru, Indiana

NEW Burt Spun Aluminum Direct and V-Belt Drive Centriflow Fan Ventilators

For institutions and other structures where a high capacity, low contour ventilator is required.

direct drive spun units

V-belt drive spun units

- **25 BASIC selections of tip speeds and capacities in direct drive models.**
- **64 BASIC selections of tip speeds and capacities in V-belt drive models.**
- **CAPACITIES from 65 to 27,648 CFM.**
- **HORSEPOWER ratings from 1/60 to 7½.**
- **SIZES from 6" through 48" wheel diameters.**
- **STATIC PRESSURE range from 0" through 1" W.G. (higher static pressures on application).**
- **LOW PROFILE heavy gauge spun aluminum housings.**
- **NON-OVERLOADING backward curved, non-sparking aluminum fan wheels.**
- **ADJUSTABLE SHEAVES on V-belt units to change capacities at any-time.**
- **DAMPERS available in drop-in sleeve type, automatic back-draft or motor operated.**
- **BURT DESIGNED for minimum noise levels.**
- **AMCA CERTIFIED capacity ratings for units of 16" wheel diameter and larger.**

Send for FREE *Data Book!*

Write for Centriflow Data Book SPV-12C-160 and Burt Data Book SPV-101-H which supplies quick data on Burt's complete line of modern Roof Ventilators

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St. Akron 11, Ohio

MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.

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*Advertiser appeared in preceding issue

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

PRESSURE REGULATORS ..... are manufactured by Watts for steam and air, and water service. They stand up under the toughest conditions you can find in industrial, commercial, or institutional applications. Maintenance is simple. Two folders tell the story.
Inside Front Cover — Item 200

TRAP INSTALLATION DATA ..... is contained in Armstrong bulletin which contains diagrams, selection data, tables, etc., as well as output ratings for all models of 30 makes of unit heaters. Also, 48-page Armstrong Steam Trap book tells how to correctly size, install and maintain steam traps for any pressure, temperature, load.
Page 1 — Item 201

CIRCULAR AIR-COOLED CONDENSERS trade named Fandaire by Aimco Products (subsidiary of Yuba) are faced right no matter what the wind direction. Low silhouette. Weigh 1/3 less. Savings in piping and installation alone may be considerable. From 3 to 120 tons. Information available.
Page 2 — Item 202

FLUSH VALVE INSTALLATION ..... by Coyne & Delany in the new Chase Manhattan Bank Building in New York City's crowded financial district consists of nearly 1,000 diaphragm type valves. Another quality installation that has made Delany the fastest growing name in flush valves. Information available.
Page 5 — Item 203

PNEUMATIC CONTROL ..... by Powers has been applied to skylight louvers at the new Madonna High School, Chicago. To meet the lighting requirements of the combination auditorium-gymnasium, a system of sky domes equipped with adjustable light dampers is used. See ad for details. Catalog of pneumatic controls for schools offered.
Pages 6-7 — Item 204

HEATING AND VENTILATING UNITS .. offered by L. J. Wing are designed to do their job no matter what your problem. Line includes gas-fired unit heaters, gas-fired duct heaters, gas-fired duct heater assemblies, and gas-fired fresh air supply heaters. Catalog data offered.
Page 9 — Item 205

COPPER WATER TUBE ..... manufactured by Reading is ideal in general plumbing, heating systems, drainage waste and vent lines, sprinkler and irrigation systems, and in rural installations. Catalog is offered.
Page 11 — Item 206

SUPER-DRY REFRIGERANTS ..... made by Allied Chemical are called Genetron. They are universally accepted for use as original or replacement charges because their tight production standards consistently exceed industry specifications for purity and dryness. Genetron 11, 12, 22, 113, and 114 available. Information offered.
Page 13 — Item 207

FANS AND VENTILATORS ..... built by Ilg can be counted on for quiet operation. Catalogs, covering the complete line of Ilg electric ventilating equipment, are available. Each product carries the rating seal of the Air Moving and Conditioning Association, Inc.
Pages 15-17 — Item 208

ROOM UNITS ..... by Warren Webster provide year-round comfort in every room at the flip of a switch. Each Newport unit has a complete system for both heating and cooling built right into it. Each area can be comfort-conditioned as the occupant requires. Equipped with Chrysler's heavy-duty commercial cooling chassis. Savings up to 30% over central-system installations. Information available.
Page 18 — Item 209

HEATING PUMPS ..... made by Skidmore obviate the need for a custom job. There is one standard pump in this company's line that will meet any one of your exacting requirements: Types VC, in single or duplex; vacuum pump in single or duplex; Type HS; and Type CCVS in three new single units and two duplex units. Four bulletins describe them all.
Page 19 — Item 210

GAS COOLING ..... is only one of many things that are accomplished with gas at the Coachman's Inn in Little Rock. Six 25-ton Arkla-Servel gas absorption units provide summer air conditioning. Source of energy for chillers is low pressure steam from a gas-fired boiler. The same boiler furnishes heat in winter. Cooking and even lighting is done with gas. Information available.
Pages 20-21 — Item 211

NEW VALVE FOLDER ..... describes the solder end and socket end valves manufactured by Jenkins. The surest way to get a quality installation in a copper tube piping system is to install this company's quality control valves. They will give a lifetime of reliable service with a minimum of attention.
Page 23 — Item 212

BETTER PIPE HANGERS ..... offered by Grinnell cost no more than competitive makes. You get a wider choice of types and sizes; better quality control; published ratings for all hangers; faster delivery from warehouses nationwide; and more responsible field service by trained personnel. Information available.
Page 24 — Item 213

DUAL DUCT UNITS ..... produced by Buensod-Stacey afford complete conditioning through all seasons of the year. Proper conditions maintained in every space. Patented automatic volume-controlled mixing units provide constant air volume in every zone, regardless of variants in static pressures. Bulletin available.
Page 25 — Item 214

ROOF-MOUNTED CONDITIONER ..... is, nine out of ten times, the most economical way to heat and cool a one-story building. This Carrier Commercial Weathermaker makes it unnecessary to give up an inch of valuable floor space. No ductwork, either, because unit connects directly to a ceiling air grille. Information available.
Page 26 — Item 215

COPPER TUBE ..... permits easier remodeling, according to The American Brass Co. Anaconda copper tube and fittings for soil, waste and vent lines cut installation time one-third to one-half. Information is available.
Page 27 — Item 216

HEAT EXCHANGERS ..... made by Taco are better because the company also makes a circulating pump and other accessories so that you can be sure of a perfectly matched and balanced system. Over 40 years of experience. The company has an exchanger to cover practically every requirement in the commercial and industrial fields. Catalog offered.
Page 28 — Item 217

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

A PROTECTIVE HOUSING ..... shields a DeBothezat Bifurcator motor from contact with hot and corrosive fumes. The result: smoother operation and lower motor maintenance cost. Information is offered.
Page 29 Item 218

FLUSH VALVES ..... tradenamed Royal by Sloan offer five main advantages: segment diaphragm of natural rubber is extra strong, provides extra long service life; inside cover makes a stronger union of body and cover; no regulation is required; shuts off automatically whether handle is held or released; and rough-in is either right or left hand. Information available.
Page 30 Item 219

HEATING AND VENTILATING UNITS designated HC by McQuay offer more flexibility and versatility. Rugged V-channel frame construction with continuous galvanized steel panels, bonderized and oven baked enamel coated, is the finest anywhere. Horizontal or vertical types available in 19 sizes. Eightfan discharge arrangements. Many other variables. Information available.
Page 31 Item 220

SHOPPING CENTER EQUIPMENT ..... from American-Standard Industrial Division consists of many coordinated products and services that provide better indoor climate control. One-source responsibility for air conditioning, heating, and ventilating equipment designed and manufactured to work together. Information available.
Insert 33-36 Item 221

DUAL-FUEL BURNER ..... offered by Iron Fireman is a completely factory built package that is simply bolted to the boiler front. Package includes both primary and secondary air systems, combustion safety controls, ignition and fuel systems for either one or two fuels, and factory engineered refractory combustion throat. Specifications offered.
Page 37 Item 222

MULTI-PATTERN DIFFUSERS ..... offered by Tuttle & Bailey are extremely flexible, which means that you have custom-selected air distribution. Diffusers are attractively styled and can be furnished with four margin styles: Beveled, flat, flush, or drop-collar. Complete details offered.
Pages 38-39 Item 223

BETTER LIVING ..... is facilitated by the many products of Borg-Warner Corporation. Among them, illustrated in colorful two-page ad are: the Norge refrigerator, the York heat pump, plumbing products of the Ingersoll-Humphryes Division, multiple-layer aluminum foil insulation (Alfol) and solar screening (KoolShade) both products of Reflectal Corp., a B-W subsidiary. Information available.
Pages 40-41 Item 224

PIPELINE INSULATION ..... from Johns-Manville brings the traditionally fine appearance and performance excellence of power plant work to general commercial and industrial installations. Brochure is offered.
Pages 42-43 Item 225

FLEXIBLE PACKAGE UNITS ..... supplied by Typhoon solved New York Hotel Warwick's cooling problems, cutting operating cost from 1/3 to 1/2. The hotel had cooled 80 bedrooms and five public rooms with a central chilled water system. There were no individual temperature controls. Operating costs were high. Problem solved with four packaged units. Reference chart and full product literature offered.
Page 44 Item 226

JOHNSON CONTROL STORY ..... depicted in colorful four-page advertisement. It tells about a Wisconsin school teacher named Johnson who decided to do something about classroom comfort and thereby launched a new industry. Information available.
Pages 45-48 Item 227

RUGGED INSULATION ..... manufactured by Gustin-Bacon and called Ultralite was the first lightweight, low-density glass fiber insulation and is still the only insulation made exclusively of long, strong, textile-type glass fibers. Introduced in 1947, it has been widely used as duct insulation and liner, metal building insulation, acoustical baffles, and for many other uses. Information available.
Page 49 Item 228

NEW TEMPERATURE CONTROL SYSTEM by Spence Engineering gives unusual control accuracy. Unique cascade-type control with throttling range adjustment independent of maximum heater pressure will tame wide ranging, fast changing loads of instantaneous heaters and modern heat exchangers. Bulletin explains.
Page 50 Item 229

HIGH PRESSURE AIR MOVER ..... available from Buffalo Forge is a heavy-duty fan for Classes III and IV service. It offers the highest efficiency over the broadest range. Quiet from its curved inlet bell to its unique Buffalo divergent outlet providing smooth outlet flow and high static regain. Bulletin contains performance, construction, capacity and dimensional details.
Page 51 Item 230

AIR HANDLERS ..... are manufactured by Halstead and Mitchell in 880 to 47,500 cfm range. They are sturdy, quiet and economical. Bulletin is offered.
Page 113 Item 231

UNITARY AIR CONDITIONERS ..... have been rated by Air Conditioning and Refrigeration Institute. Seal of certification is public's guarantee that equipment meets its published standards of performance. Directory of participating manufacturers and explanatory booklet are offered.
Page 115 Item 232

HEATING AND COOLING COILS ..... made by Westinghouse are better because air activating guides increase turbulance for greater heat transfer. Also, there is more prime surface than on any other coil. New application manual with complete data for consulting and designing engineers is available. Manual's format is the one recommended by the Committee of 100 Consulting Engineers.
Page 117 Item 233

PACKAGED AUTOMATIC BOILERS ... offered by Orr & Sembower offer an exclusive 5 to 1 turndown. It gives you equal efficiency from 20% to 100% of full firing rate or any load in between. This feature is only one of the many reasons why you get more for your boiler dollar with Powermaster. Bulletin available.
Page 119 Item 234

STEEL WELDING FITTINGS ..... produced by Nibco and trade named Husky can now be installed for no more than threaded system. A saving up to 85% per fitting over other welded fittings now in use. Ideal for all Schedule 40 piping. Fully complies with ASTM A234 specification. Information available.
Page 121 Item 235

NEW PACKAGED CONDITIONER ..... offered by York is 33.3 tons and answers a booming demand for larger capacity. Easily adapts to any cooling need: a single unit, without ductwork, easily cools large open areas; can be used individually for large rooms or centrally with ductwork for small rooms; or may be installed floor by floor with simple ductwork to partitioned areas. Information available.
Page 123 Item 236

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. All advertisements are digested here except those that are received too late for inclusion in this listing.

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

CONDENSING UNITS .....
produced by Bell & Gossett boast compressors distinguished by quieter operation and less vibration. All have only one bore diameter. A few interchangeable parts will service all units, reducing maintenance problems. All major parts of packages are made and guaranteed by the company. Information available.
Page 125 Item 237

SOLENOID VALVES .....
made by Sporlan offer peak performance for refrigerant, water, steam, or hot gas applications—with synthetic seating (introduced in 1946), color coded lead wires (since 1955) and pilot controls (1940). These three features were among the many Sporlan firsts. Bulletin explains.
Page 127 Item 238

PYROMETER .....
manufactured by Illinois Testing Laboratories under the Alnor label is the most valuable instrument in the tool kit for the heating and air conditioning contractor. One, with full 6-inch mirrored scale, with temperature range from minus 40 deg F to 200 deg, in attractive, durable case, costs under $200. Information available.
Page 128 Item 239

PACKAGED BOILER .....
offered by Petro has no base or low water line, reducing height as much as 24 inches. No pitting is necessary. Uses exhaust vent only; no stack is needed. Combustion achieved even in cold fire box for outstanding fuel economy. Literature and specifications offered.
Page 129 Item 240

NEW DIFFUSER .....
made by Air Devices, Inc., has radically new means of controlling air direction at four different angles of discharge simultaneously. The result is positive adjustability with finger-tip air direction control. Bulletin offered.
Page 130 Item 241

SOLENOID VALVES .....
for positive control are made by Alco. Their high quality guarantees maximum life. Constructed both for hermetic and non-hermetic applications. More than 125 models for every control application: Liquid, suction, hot gas, water, steam, and air. Specifications bulletin available.
Page 131 Item 242

LOW COST AIR CLEANER .....
produced by Mamco Corp., offers you the chance to get into a huge, rich market ahead of competition. Every home is a prospect for a Health-Air unit. Three-stage unit includes mechanical filter, electrostatic filter, and charcoal filter. Information available.
Page 132 Item 243

NEW PACKAGED STEEL BOILER .....
by Burnham is of the 3-pass, Scotch-type. A high point in efficient, low maintenance heating for schools, office buildings, all commercial and institutional installations. Certified efficiencies better than 80%. Flue gas between 400 and 500 deg F. Full ratings and data offered.
Page 133 Item 244

ALL ALUMINUM GRILLES .....
made by A-J Mfg. Co. are the no-vision type, are only 13/16th-inch thick, and have no bulky depth to extend beyond door thickness. Excellent for duct installation for supply and return air. Sight-proof from any angle. Corrosion and rust-proof. 1960 catalog offered.
Page 134 Item 245

BOOSTER AND UNIVERSAL PUMPS ...
offered by Bell & Gossett boast quiet operation. Whether for residential or commercial applications of a forced hot water system, quiet operation on the circulating equipment is essential. From the company-built motors to the Remite leak-proof seals, pumps are specialized units. Product catalog offered.
Page 135 Item 246

THERMOSTATIC SHOWER MIXER ....
offered by Lawler is of such advanced design that it will never go out of style. The Recesso is entirely recessed into the wall, eliminating dangerous protruding edges which might cause bodily injury or collect dirt or scum. A safe, sensitive, instant-acting control. Information available.
Page 137 Item 247

MORE HOT WATER .....
can be had, and fast, too, with a Ewing automatic heavy-duty vertical hot water heater. And for less cost because it requires no expensive storage boilers, is simple and easy to install and operate, requires no maintenance, and saves valuable floor space. Information available.
Page 138 Item 248

SPACE-SAVING CHILLER .....
by Vilter is especially suited for air conditioning applications, though it is readily adaptable to almost any liquid chilling system. Four standard sizes: 25, 50, 75, and 100-ton nominal capacities. Flooded-type shell and tube cooler and the condenser are mounted above a rugged compressor. Shipped with all wiring, insulation, refrigerant. Full details and application recommendations offered.
Page 139 Item 249

NEW TRIANGLE VALVE .....
by U. S. Valve & Engineering Co. is a combination of two precision-engineered butterfly valves in a flanged tee. Gives perfect flow control in cooling water systems where two streams flow to or from a single pipe. Information available.
Page 139 Item 250

FLEXIBLE HOSE, RETRACTABLE DUCT
offered by Flexaust have lowered installation costs in thousands of successful jobs. Other advantages include: exceptional abrasion resistance; corrosion resistance; noise absorption; provision for expansion and contraction. Full details are available.
Page 140 Item 251

GLASS TINTING .....
is a new practical way to cut air conditioning operating costs by as much as 30%. Called Sun-X, the revolutionary Du Pont liquid is applied quickly and neatly to windows without disrupting regular business routines. Guaranteed not to chip, crack or peel. Available in 11 colors. Folder explains.
Page 141 Item 252

INDUSTRIAL DIFFUSERS .....
are available in a complete range of sizes to meet any industrial requirement. Adjusted easily from the floor to deliver any air pattern. Barber-Colman bulletin contains performance data, installation diagrams, and dimensions.
Page 142 Item 253

AIRTURNS .....
available from Barber-Colman, guide air around corners in duct systems, saving space and money. They minimize pressure losses, too. Superior to the performance of any other factory-made units available. Mass production results in modest initial cost. Complete details available.
Page 142 Item 254

RESIDENTIAL EVAPORATORS .....
are designed especially for duct systems by Bohn. They provide predictable performance and are rated at ASRE conditions. Both horizontal and vertical units are available in five sizes to match condensing units of 2, 3, 4, 5, and 7½ hp. Circuiting suitable for R-12 or R-22. Information available.
Page 143 Item 255

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

HIGH TEMPERATURE WATER ..... economies are realized throughout the year at New York's International Airport. In addition to heating the vast Terminal City, 380F water, produced by four International-LaMont Generators, feeds nine absorption machines. Bulletin on generators available.
Page 144 Item 256

CONDENSATE DISPOSAL PUMPS .... from March Mfg. Co. in a complete line of low-cost units are designed for air conditioning and refrigeration. All pumps furnished with 110/220 volt motors, factory tested and ready to run. Bulletins offered.
Page 145 Item 257

FLAME-RESISTANT DUCT TAPE ..... by Arno complies with all building codes, is self-adhesive, will not support flame. There is nothing to mix, so saves labor. It is vapor proof, water proof, and meets ASTM standards. Free test sample offered.
Page 145 Item 258

LOW PROFILE ROOF FAN ..... by Davidson has new and streamlined design for today's modern flat roof structures. As much as 40% lower than conventional types. Capacities to 50,000 cfm. Information available.
Page 145 Item 259

WASHABLE AIR FILTER ..... developed by Air-Maze uses no oil, is completely dry, and yet can be washed clean in cold water. Bulletin describes this filter.
Page 145 Item 260

NON-CLOG SEWAGE PUMPS ..... manufactured by Chicago Pump Co. have many outstanding advantages, including balanced impellers which provide quiet operation with high pump and non-clogging efficiency; expansion joints in discharge pipe to prevent pump distortion; simple, dependable micrometer adjustment; and heavy duty shafts and bearings. Over 50,000 installations. Bulletin available.
Page 146 Item 261

ELECTRIC STEAM BOILERS ..... are manufactured by P. M. Lattner Mfg. Co. in ten sizes. Of ASME construction, the units have highly sensitive adjusting controls. Information is available.
Page 147 Item 262

PRESSURE BURNERS ..... for dual-fuel, gas, or oil are offered by Synchronous Flame. Designed for hard-to-fire jobs: all types of boilers, warm air furnaces, and ovens. Many standard features which are extras on other burners. Detailed information offered.
Page 147 Item 263

EXTRUDED ALUMINUM SHUTTERS .... from Elgo Shutter & Mfg. Co. are of modern design, light weight, fully weather-stripped, easier to install, and are rust and corrosion proof. Complete specifications are available.
Page 147 Item 264

HIGH VELOCITY AIR FILTERS ..... from Air Filter Corp. feature high efficiency, minimum resistance, no direct air passage and large dust holding capacity. Catalogs are available.
Page 147 Item 265

TWO NEW SUBMERSIBLE PUMPS ..... offered by Kenco. A 3-phase, 230-volt industrial pump is of rugged cast-bronze with 5000 gph at 10-ft head. Fully automatic, complete with external liquid level control and motor starting. Another unit is offered to remove measured amounts of fluid automatically determined by the height at which the hi-turn-on control is set. Information is available.
Page 148 Item 266

FLEXIBLE AIR DUCT ..... by Wiremold, unlike any other duct, mechanically locks to the fabric making it cuffless and always ready to hook up, simply by sliding it over the end fitting. Fastens with a sheet metal screw. Saves time and money on every connection. New folder offered.
Page 148 Item 267

LOW PRESSURE CONDENSATE PUMPS from Sterling, Inc., are specially engineered, not just adaptations of industrial or water supply pumps. Complete information is available.
Page 150 Item 268

PACKAGED ROOF-MOUNT UNITS .... made by Ventil-Aire save 12% on installation and 7% in construction costs on a 10,000 sq ft building. These packaged air conditioning and heating systems combine all the elements of built-up systems into one compact package. Available in 5, 7½, 10, and 15-ton sizes. Illustrated literature and case histories offered.
Page 151 Item 269

AIR FILTER INSTITUTE ..... lists its members, from whom you can buy air filters with confidence. Information available.
Page 152 Item 270

POCKET CAPACITOR TESTER ..... called Cappy is an electronic instrument designed to test all types of capacitors and condensers, both a-c and d-c. Manufacturer, Watsco Inc., offers brochure.
Page 152 Item 271

ELECTRIC BLOWERS ..... made by Peerless Electric stabilize air-supported structures even in 70-mph winds. Twelve centrifugal blowers with a discharge of 22,000 cfm each, are responsible for inflation and support of the Army's hemispheric Pentadome. Company pioneered air-supported structures, including Radomes. The same skills are available to you. Inquiries are invited.
Page 153 Item 272

INSULATION ADHESIVE ..... as well as Weathercoat, Mastic Weathercoat, and Floor Mastic Binder are offered under the Laykold label by American Bitumuls & Asphalt Co. Laykoid asphalts have a history of performance in the cold-storage construction field. See ad for diagram showing best way to handle typical cold-storage construction. Information is available.
Page 154 Item 273

COPPER TUBE BOILERS ..... in Bryan Steam Corp.'s Series 500 are specified by engineers because of the rapid, maximum heat transfer with proven copper tubes. Because units are compact, space-saving, delivered completely assembled, they install quickly, anywhere. Available with firing rates as low as 125,000 Btu. For gas and oil. Information offered.
Page 155 Item 274

SPUN ALUMINUM VENTILATORS ..... are offered by The Burt Mfg. Co. in both direct drive and V-belt drive units. A databook which is available describes the company's complete line of modern roof ventilators.
Page 156 Item 275

REFRIGERATION SPECIALTIES ..... manufactured by Henry Valve Co. include its Dri-Vue indicator port, Dri-Vue indicators, Dri-Cor filter-driers, Dri-Cor cartridge driers, and shut-off valves. For refrigeration, air conditioning, and industrial applications. Information available.
Inside Back Cover Item 276

LOW WATER CUT-OFFS ..... should be installed on hot water boilers, say engineers, contractors and manufacturers in the field. The what-why-how is described in a free booklet, "Basic Safety Controls for Hot Water Space Heating Boilers," offered by McDonnell & Miller.
Back Cover Item 277

CIRCLE FOR NEW EQUIPMENT AND LITERATURE INQUIRIES

CIRCLE FOR AD-DIGEST INQUIRIES

PLEASE PRINT CLEARLY

TO ORDER BOOKS DESCRIBED BELOW

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
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288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....Zone ....State .....

Please send and bill me for the books circled: May '60

A B C D E F G H I J K L M N O P Q R S T U V

This service is not available to overseas readers. Cards are void after August 1, 1960.

FIRST CLASS
PERMIT NO. 53
NEW YORK, N. Y.

BUSINESS REPLY CARD
NO POSTAGE NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

AIR CONDITIONING, HEATING and VENTILATING
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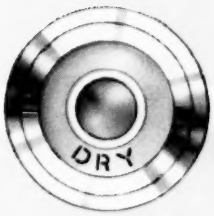

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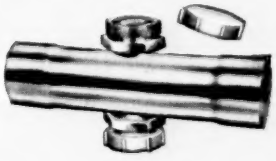

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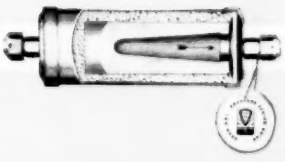

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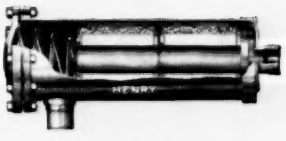

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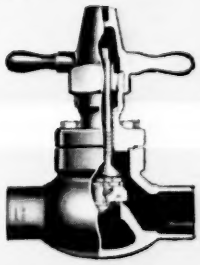

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In fact, many local codes now require a low water cut-off, or feeder cut-off combination, on hot water boilers installed in places of public occupancy—including multiple dwelling units.

Notice the diagrams of recommended installations opposite. For more detailed discussion get this booklet that tells the whole story: "Basic Safety Controls for Hot Water Space Heating Boilers."

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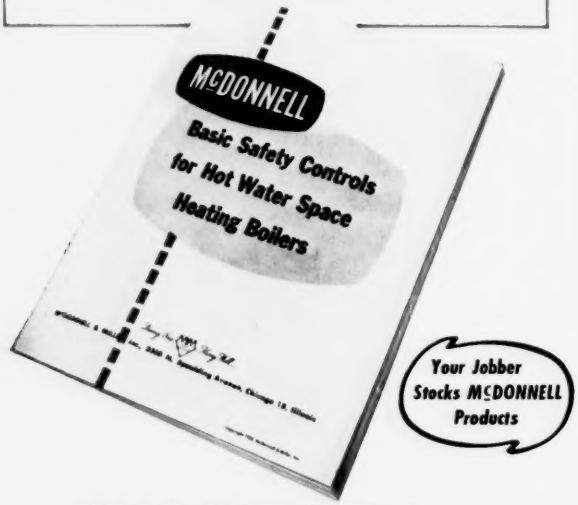

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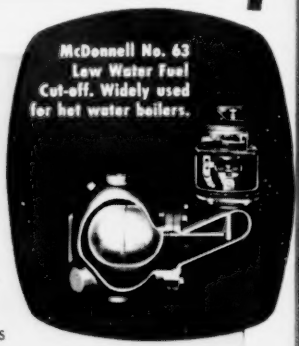

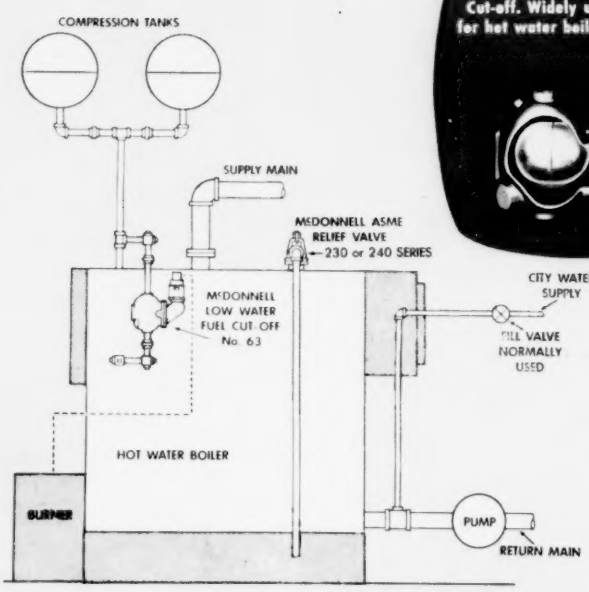

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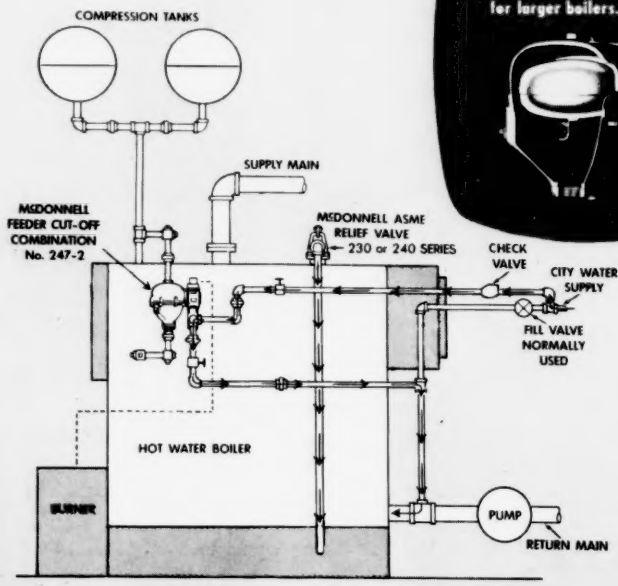

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